Meridian 1

# Option 11C

2.0 Mb DTI/PRI

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# About this guide

This document contains specifc information on how to configure 2.0 Mb ISDN DTI/PRI on Meridian 1 Option 11C. For general information on ISDN, and for information on software features, refer to *X11 Networking Features and Services* (553-2901-301).

This document is a global document. Contact your system supplier or your Nortel Networks representative to verify that the hardware and software described is supported in your area.

# ISDN features

For a detailed description and implementation information, see the *X11 Networking Features and Services* (553-2901-301).

For a detailed description and implementation information for DPNSS1, see the *DPNSS1: Features and Services Guide* (553-3921-300).

For a detailed description and implementation information for DASS2, see the *DASS: Features and Services Guide* (553-3911-300).

# 2.0 Mb DTI Implementation

## Contents

This section contains information on the following topics:

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## Overview

This chapter provides the information required to install the 2.0 Mb DTI card in Meridian 1 Option 11C systems. It includes information for:

- hardware installation
- software programming

With the introduction of Release 25.3x, the 2.0 Mb DTI card is now supported in Option 11C IP expansion cabinets. This increased capability is possible with the introduction of IP daughterboards in expansion cabinets and 100BaseTor F connectivity with the Main cabinet.

# Hardware Requirements

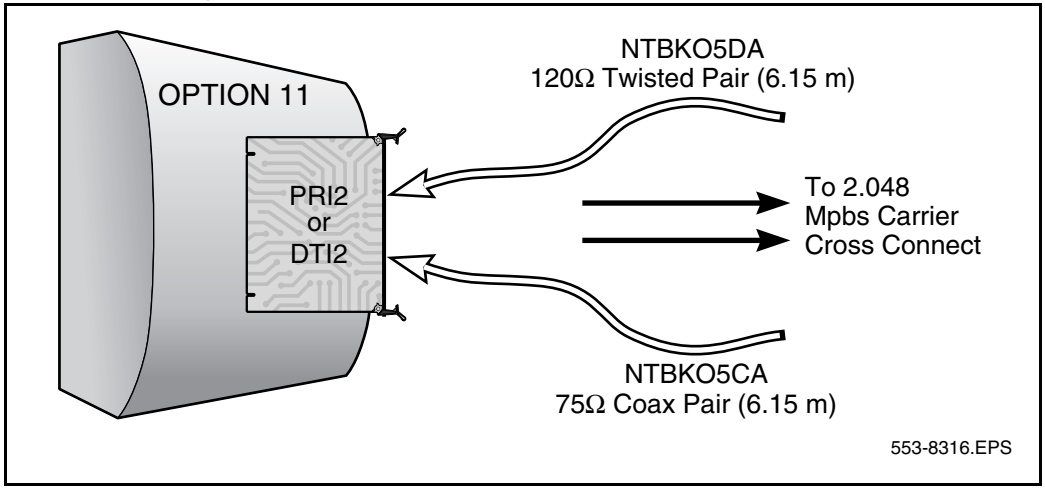
Hardware requirements for 2.0 Mb DTI are as follows:

- 2.0 Mb DTI Circuit card - NTAK10
  (a Clock Controller is incorporated into the circuit card)
- CEPT Cable – NTBK05DA (120 ¾ twisted pair – 6.15 m length)

**or**

CEPT Cable – NTBK05CA (75 ¾ coaxial – 6.15 m length)

**Figure 1**
**2.0 Mb DTI Cabling**



# NTAK10 2.0 Mb DTI card

The 2.0 Mb Digital Trunk Interface card provides the physical interface for the digital E-1 carrier on the Option 11C system. The card includes an on-board clock controller and is installed in slots 1 through 9 in the main cabinet. On IP Expansion cabinets, it may be placed in slots 11-19, 21-29, 31-39, 41-49 of the first, second, third, and fourth expansion cabinets, respectively.

The NTAK10 2.0 Mb DTI card is also used for ISL shared mode applications.

For information on the NTAK10 faceplate LEDs, refer to DTI Maintenance in this guide.

# Install DTI hardware

The NTAK10 circuit card can be installed in any available card slot 1-9 in the main cabinet. On IP Expansion cabinets, it may be placed in slots 11-19, 21-29, 31-39, 41-49 of the first, second, third, and fourth expansion cabinets, respectively

## Inspect the NTAK10 circuit card

Inspect the circuit card before installing it in the main cabinet:

- Locate the NTAK10 2.0 Mb circuit card and carefully remove it from its packaging.
- Inspect the circuit card for any visible damage which may have occurred during shipping.

## Set the switches

The NTAK10 incorporates four surface mounted dip switches. The following tables provided information on the various settings and related functions of these switches.

> ***Note:*** The ON position for all the switches is towards the bottom of the card. This is indicated by a white dot printed on the board adjacent to the bottom left corner of each individual switch.

Set the switches found on the circuit card as per the requirements of your specific installation.

### Switch S1—Clock Controller Configuration

This switch enables/disables the on-board Clock Controller.

**Table 1**
**Switch S1**

| Switch | Off (Up) | On (Down) |
|---|---|---|
| S1-1 | Spare | Spare |
| S1-2 | Clock Controller Enabled | Clock Controller Disabled |

### Switch S2—Carrier Impedance Configuration

This switch sets the carrier impedance to either 120¾ or 75¾. Twisted pair cable is usually associated with 120¾. Coaxial cable is usually associated with the 75¾ setting.

**Table 2**
**Switch S2**

| Switch | Off (Up) | On (Down) |
|---|---|---|
| S2-1 | 120¾ | 75¾ |
| S2-2 | 75¾ | 120¾ |

### Switch S3—Mode of Operation

This switch selects the mode in which the NTAK10 operates. The NTAK10 supports firmware that allows it to operate in the standard CEPT format mode, or the modified CEPT format used in France.

**Table 3**
**Switch S3**

| Switch | Off (Up) | On (Down) |
|---|---|---|
| S3-1 | Non-French Firmware | French Firmware |
| S3-2 | Spare | Spare |

### Switch S4—Carrier Shield Grounding

This switch allows for the selective shield grounding of the Tx and/or Rx pairs of the carrier cable. Closing the switch (down position) applies Frame Ground (FGND) to the coaxial carrier cable shield, creating a 75¾ unbalanced configuration. The Tx and Rx pairs are referenced with respect to the 2.0 Mb DTI card (i.e. Rx is carrier received from the far end device).

**Table 4**
**Switch S4**

| Switch | Off (Up) | On (Down) |
|---|---|---|
| S4-1 | Receive Shield Unconnected | Frame Ground on Receive Shield |
| S4-2 | Transmit Shield Unconnected | Frame Ground on Transmit Shield |

***Note:*** The usual method is to ground the outer conductor of the receive coax signal.

## Insert the NTAK10

Slide the circuit card into any unused slot 1 through 9 in the main cabinet, or in slots 11-19, 21-29, 31-39, 41-49 of the first, second, third, and fourth IP xpansion cabinets, respectively. Secure the circuit card in the cabinet by locking the lock latch assemblies.

## Connect the cables

- In the cabling area, located directly below the card cage, remove the retaining bar used to secure the MDF cables. Connect the NTBK05DA/CA interface cable to the 50-pin Amphenol connector below the card slot holding the NTAK10 2.0 Mb DTI circuit card. Re-install the retaining bar to secure the cable(s) in place.
- Terminate the NTBK05DA/CA carrier cable as required.

### NTBK05DA pinouts

The pinouts for the NTBK05DA cable are as follows:

**Table 5**
**NTBK05DA pinouts**

| From: 50 pin MDF connector | To: 9 pin connector | Colour | Signal |
|---|---|---|---|
| pin 23 | pin 6 | Black | R0 |
| pin 48 | pin 7 | White | T0 |
| pin 50 | pin 9 | Bare | R0/T0 FGND |
| pin 24 | pin 2 | Black | R1 |
| pin 49 | pin 3 | Red | T1 |
| pin 25 | pin 5 | Bare | R1/T1 FGND |

### NTBK05CA pinouts

The pinouts for the NTBK05CA cable are as follows:

**Table 6**
**NTBK05CA pinouts**

| From: 50 pin MDF connector | To: Transmit coax connector | To: Receive coax connector | To: 50 pin MDF connector |
|---|---|---|---|
| pin 23 | Inner conductor | — | — |
| pin 48 | outer conductor | — | — |
| pin 24 | — | Inner conductor | — |
| pin 49 | — | outer conductor | — |
| pin 21 | — | — | pin 49 |
| pin 46 | — | — | pin 48 |

# DTI software programming

The following procedure describes the process required to program basic 2.0 Mb DTI on the Meridian 1 Option 11C main and IP expansion cabinets.

## Task summary list

The following is a summary of the tasks in this section:

**1** LD 17 – Add a 2.0 Mb DTI card.

**2** LD 73 – Define the 2.0 Mb DTI ABCD signaling bit tables.

**3** LD 73 – Define the 2.0 Mb DTI pad tables.

**4** LD 73 – Define the 2.0 Mb DTI timers.

**5** LD 73 – Define the 2.0 Mb DTI system timers.

**6** LD 16 – Configure the service routes.

**7** LD 14 – Define the associated list of service trunks.

**LD 17** – Add a 2.0 Mb DTI card.

| Prompt | Response | Description |
|---|---|---|
| REQ: | CHG | |
| TYPE: | CEQU | Change common equipment |
| ... | | |
| DTI2 | xx | Enter a card slot number for 2.0 Mb DTI.<br>xx = 1-9 in main cabinet.<br>xx = 11-19, 21-29, 31-39, 41-49 in IP expansion cabinets 1-4, respectively. |

**LD 73** – Define the 2.0 Mb DTI ABCD signaling bit tables.

| Prompt | Response | Description |
|---|---|---|
| REQ | NEW<br>CHG | Add or change Digital Trunk Interface data block |
| TYPE | DTI2 | 2.0 Mb/s DTI data block |

| Prompt | Response | Description |
|---|---|---|
| FEAT | ABCD | ABCD bit signaling category. |
| SICA | 2-16 | Signaling category |
| ... | | |
| DFLT | (1)-16 | Default signaling category to be used for default values<br>JDMI defaults to 16 with <CR>[3]. |
| **Incoming/Outgoing Calls:** | | |
| IDLE(S) | abcd | (Send) idle signal bits |
| IDLE(R) | abcd | (Receive) idle signal bits |
| FALT(S) | abcd | (Send) bits. 2.0 Mb DTI out-of-service |
| | N | If FALT (send) signal not required |
| FALT(R) | abcd | (Receive) bits. 2.0 Mb DTI out-of-service |
| | N | If FALT (receive) signal not required |
| **Incoming Calls:** | | |
| SEZ(R) | abcd | Seize signal (send or receive) for voice or data calls from or to a non-SL-1. |
| SEZD(R) | abcd | Seize signal (send or receive) for data calls between SL-1s. |
| | N | If SEZD(R) signal not required |
| SEZV(R) | abcd | Seize signal (send or receive) for voice calls. |
| | N | If SEZV(R) signals not required |
| P CALL(R) | abcd | (Receive) signal sent during seize by an incoming CO trunk. |
| TIME | ON OFF | Length of pulse time on, and time off.<br>(default 2 seconds on, 8 seconds off) |
| SEZA(S) | abcd | Seize signal acknowledgment (send). |
| | N | If SEZA(S) signal not required |
| P WNKS(S) | abcd | Wink start (corresponds to a pulsed seize acknowledgment).Prompted when SEZA(S) not required. |
| | N | If WNKS(S) signal not required |
| TIME | 10-(220)-630 | Time for WNKS(S) signal in milliseconds |
| P DIGT(R) | abcd | (Receive) decadic pulses |
| | N | If DIGT(R) not required |
| NRCV(S) | abcd | Number received signal (send). |

| Prompt | Response | Description |
|---|---|---|
| | N | If NRCV(S) signal not required |
| P EOSF(S) | abcd | End of selection free (send) |
| | N | If EOSF(S) not required |
| TIME | (100)-150 | Time for EOSF(S) in milliseconds |
| P EOSB(S) | abcd | End of selection busy (send) |
| | N | If EOSB(S) not required |
| TIME | (100)-150 | Time for EOSB(S) in milliseconds |
| P OPCA(R) | abcd | Operator calling time (receive) signal |
| | N | If OPCA(R) not required |
| TIME | 64-(128)-192 | Time of OPCA(R) pulse in milliseconds |
| REPT | (1)-5 | Number of OPCA(R) pulses. |
| CONN(S) | abcd | Connect send |
| CONN(R) | abcd | Connect receive |
| P RRC(S) | abcd | Register recall (send) signal. Activated by Malicious Call Trace. |
| | N | If RRC(S) not required |
| TIME | 10-(100)-150 | Time of RRC(S) signal in milliseconds |
| P BURS(S) | abcd | Bring up receiver (send). Uses switch-hook flash timer for timer. |
| | N | If BURS(S) not required |
| P BURS(R) | abcd | Bring up receiver (receive). Uses switch-hook flash timer for timer. |
| | N | If BURS(R) not required |
| TIME | 64-(128)-192 | Length of BURS(R) pulse in milliseconds |
| P CAS(S) | abcd | CAS Flash. Same timing as analogue trunks.<br>***Note:*** Prompted for JDMI only. Operational only if CASM package equipped. |
| | N | If CAS(S) not required |
| CLRB(S) | abcd | Clearback (send) signal. |
| | N | If CLRB(S) not required (IDLE signal is used). |
| P RCTL(S) | abcd | Release control (send) signal. |

| Prompt | Response | Description |
|---|---|---|
| | N | If RCTL(S) not required |
| | | ***Note:*** Prompted only when CLRB is unused or is defined the same as IDLE. |
| TIME | 100-(150)-300 | Time value is stored in multiples of 10 milliseconds. |
| R RCOD(S) | abcd | Release Control Originating party Disconnect. This signal is another pulsed SL-1 signal sent on incoming trunks when the originating party disconnects first. |
| | N | If RCOD(S) not required |
| TIME | 150 | Timer value in milliseconds is fixed |
| P OPRS(R) | abcd | Operator (receive) manual recall signal |
| | N | If OPRS(R) not required |
| TIME | xxx yyy | Minimum and maximum time range for OPRS(R) in milliseconds. |
| | | xxx = 8-(48)-2040<br>yyy = xxx-(128)-2040 |
| P NXFR(S) | abcd | Network transfer signal (send) pulse. Pulse time not variable. |
| | N | If NXFR(S) not required |
| P ESNW(S) | abcd | ESN wink signal (send) pulse. Pulse time not variable. |
| | N | If ESNW(S) not required |
| P CAS(S) | abcd | Centralized Attendant signal (send) pulse. Pulse time not variable. |
| | | ***Note****:* Prompted for 2.0 Mb DTI only. |
| | N | If CAS(S) not required |
| CLRF(R) | abcd | Clear forward (receive) |
| | N | If CLRF(R) not required |
| SOSI | abcd | Special operator signal defined |
| | (N) | Undefined. Prompted when OPRC = N |
| **Outgoing Calls:** | | |
| SEZ(S) | abcd | Seize voice or data from or to a non SL-1 switch |
| SEZD(S) | abcd | Seize data (send) signal. Only for SL-1 to SL-1 applications |
| | N | If SEZD(S) not required |
| SEZV(S) | abcd | Seize voice (send) signal. Only recommended for SL-1 to SL-1 applications |

| Prompt | Response | Description |
|---|---|---|
| TIME | xxx yyy | Minimum and maximum time range for OPRS(R) in milliseconds.<br><br>xxx = 8-(48)-2040<br>yyy = xxx-(128)-2040 |
| | N | If SEZV(S) not required |
| SEZA(R) | abcd | Seize acknowledgment (receive) signal |
| | N | If SEZA(R) not required |
| P WNKS(R) | abcd | Wink start pulsed seize acknowledgment (receive) signal |
| | N | If P WNKS(R) not required |
| TIME | 20-(140)-500,<br>20-(290)-500 | Minimum and maximum length of WNKS(R) pulse in milliseconds |
| P EOS(R) | abcd | End of selection (receive) signal |
| | N | If EOS(R) not required |
| TIME | (64)-320<br>64-(256)-320 | Length of EOS(R) pulse stored in multiples of 8 milliseconds. |
| CONN(S) | abcd | Connect send |
| CONN(R) | abcd | Connect receive |
| P OPRC(R) | abcd | Operator recall signal for special services. minimum three pulses of 160 milliseconds each. |
| | N | If OPRC(R) not required |
| P BURS(S) | abcd | Bring up receiver (send) for L1 networking |
| | N | If BURS(S) not required |
| P BURS(R) | abcd | Bring up receiver (receive) for L1 networking |
| | N | If BURS(R) not required |
| TIME | 64-(128)-192 | Length of BURS(R) pulse in milliseconds. |
| | N | If SEZV(S) not required |
| P CAS(R) | abcd | CAS Flash. Same timing as analogue trunks. Prompted for JDMI only. Operational only if CASR package equipped. |
| | N | If CAS(R) not required |
| CLRB(R) | abcd | Clear back |
| | N | If CLRB(R) not required, when IDLE would be used |
| P RCTL(R) | abcd | Release control. Prompted only when CLRB is unused or is defined the same as IDLE. |

| Prompt | Response | Description |
|---|---|---|
| | N | If RCTL(R) not required |
| TIME | 96-(128)-320<br>96-(256)-320 | Time value stored in multiples of 8 milliseconds |
| P NXFR(R) | abcd | Network transfer |
| | N | If not required |
| P ESNW(R) | abcd | ESN wink signal |
| | N | If ESNW(R) not required |
| P CAS(R) | abcd | Centralized attendant service signal.<br>2.0 Mb DTI only[3] |
| | N | If CAS(R) not required |
| CLRF(S) | abcd | Clear forward (send) |
| | N | If CLRF(S) not required |
| TIME | (0) | 800 milliseconds |
| | | ***Note:*** Prompted when the abcd bits entered in response to the CLFR(S) prompt are different from the abcd bits of the IDLE signal |
| SOSO | abcd (N) | Special operator signal defined (undefined). |
| | | ***Note:*** Prompted when OPRC = N |

LD 73 – Define the 2.0 Mb DTI pad tables.

| Prompt | Response | Description |
|---|---|---|
| REQ | NEW<br>CHG | Add or change Digital Trunk Interface data block |
| TYPE | DTI2 | 2.0 Mb DTI |
| FEAT | PAD | Request the digital pad feature. |
| PDCA | 1-16 | PAD Category table.<br>If one channel is using the specified table, then the command is aborted.<br>Table 1 cannot be modified or deleted. |
| TNLS | YES (NO) | TN List. This is for the print command only.<br>A YES response means that a list of the trunk TNs using the requested PAD category tables will be printed after the table. |
| DFLT | (1)-16 | For NEW only. The table is used for default values. |
| The following prompts define the pad levels.<br>The receiving pad code is *r* and the transmission pad code is *t*. These entries have the range 0-15. The pad values (in decibels) relating to these codes are shown after this table. | | |
| ONP | r t | On-premises extension |
| OPX | r t | Off-premises extension |
| DTT | r t | Digital TIE trunks |
| SDTT | r t | Digital Satellite TIE trunks |
| NTC | r t | Nontransmission compensated |
| TRC | r t | Transmission compensated |
| DCO | r t | Digital COT, FEX, WAT, and DID trunks |
| VNL | r t | Via Net Loss |
| DTO | r t | 2.0 Mb DTI digital TOLL office trunks |
| ACO | r t | Analogue CO or WATS trunks |
| AFX | r t | Analogue FEX trunks |
| ADD | r t | Analogue DID trunks |
| SATT | r t | Analogue satellite TIE trunks |
| TNLS | YES (NO) | TN List. This is for the print command only.<br>A YES response means that a list of the trunk TNs using the requested PAD category tables will be printed after the table. |

| | | |
|---|---|---|
| DFLT | (1)-16 | For NEW only. The table is used for default values. |
| The following prompts define the pad levels.<br>The receiving pad code is *r* and the transmission pad code is *t*. These entries have the range 0-15. The pad values (in decibels) relating to these codes are shown after this table. | | |
| ONP | r t | On-premises extension |
| OPX | r t | Off-premises extension |
| TNLS | YES (NO) | TN List. This is for the print command only.<br>A YES response means that a list of the trunk TNs using the requested PAD category tables will be printed after the table. |
| DFLT | (1)-16 | For NEW only. The table is used for default values. |
| The following prompts define the pad levels.<br>The receiving pad code is *r* and the transmission pad code is *t*. These entries have the range 0-15. The pad values (in decibels) relating to these codes are shown after this table. | | |
| ONP | r t | On-premises extension |
| OPX | r t | Off-premises extension |
| DTT | r t | Digital TIE trunks |
| SDTT | r t | Digital Satellite TIE trunks |
| NTC | r t | Nontransmission compensated |
| TRC | r t | Transmission compensated |
| DCO | r t | digital COT, FEX, WAT, and DID trunks |
| VNL | r t | Via Net Loss |
| DTO | r t | 2.0 Mb DTI digital TOLL office trunks |
| ACO | r t | Analogue CO or WATS trunks |
| AFX | r t | Analogue FEX trunks |
| ADD | r t | Analogue DID trunks |
| SATT | r t | Analogue satellite TIE trunks |
| ATO | r t | Analogue TOLL office trunks |
| DTI2 | r t | 2.0 Mb DTI trunk<br>(prompted only if the 1.5/2.0 Mb Gateway feature is equipped and TYPE=DTI2) |

| | | |
|---|---|---|
| XUT | r t | Analogue CO trunk<br>(prompted only if the 1.5/2.0 Mb Gateway feature is equipped and TYPE=DTI2) |
| XEM | r t | Analogue TIE trunk<br>(prompted only if the 1.5/2.0 Mb Gateway feature is equipped and TYPE=DTI2) |

The following pads are available for the 2.0 Mb DTI card. Their respective codes are also given. Positive dB represents loss and negative dB represents gain.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **code** | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| **value (dB)** | 0.0 | +1.0 | +2.0 | +3.0 | +4.0 | +5.0 | +6.0 | +7.0 |
| **code** | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| **value (dB)** | +8.0 | +9.0 | +10.0 | +11.0 | +12.0 | +13.0 | +14.0 | -1 |
| **code** | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| **value (dB)** | -2 | -3 | -4 | -5 | -6 | -7 | -8 | -9 |
| **code** | 24 | 25 | 26 | | | | | |
| **value (dB)** | -10 | idle | +0.6 | | | | | |

LD 73 – Define the 2.0 Mb DTI timers.

| **Prompt** | **Response** | **Description** |
|---|---|---|
| REQ | NEW<br>CHG | Add or Change Digital Trunk Interface data block |
| TYPE | DTI2 | 2.0 Mb DTI |
| FEAT | LPTI | Set the timers used for a 2.0 Mb DTI |
| LOOP | xx | 2.0 Mb DTI card slot number.<br>xx = 1-9 in main cabinet.<br>xx = 11-19, 21-29, 31-39, 41-49 in IP expansion cabinets 1-4, respectively. |
| P DIGT (S) | abcd | Digit pulse timing from TDS (Bits P, X or U are selectable) |
| | N | If DIGT(S) signal not required |
| P METR(R) | abcd | Metering (receive). Bits P, X or U. Only two P bits allowed. COT and DID trunks only.<br>***Note:*** PPM package must be enabled. |

| | | |
|---|---|---|
| | N | If METR(R) signal not required |
| EDGE | 0 | PPM bit counted when changed from 1 to 0. |
| | 1 | PPM bit counted when changed from 0 to 1. |
| TIME | 40-(240)-480 | Maximum time METR signal can be on in milliseconds. |
| SASU | 0-(1920)-8064 | Seize acknowledge supervision period in milliseconds.<br>2.0 Mb DTI default = 1920 |
| MFAO | YES (NO)<br><CR> | DTI card will or will not set bit 3 of timeslot 0 if loss of Multiframe Alignment Signal (MFAS) occurs.<br>2.0 Mb DTI default = NO<br><br><cr> = no change is required |
| SZNI | YES (NO) | PSTN incoming seizure during lockout of MFAS and far-end fault states allowed (denied) |
| MFF | CRC | Multiframe format - Cyclic Redundancy Check (CRC 4) |
| | (AFF) | Alternative Frame Format |
| | | ***Note:*** Prompted for Option 11C only. For non Option 11C only AFF is supported. |

The following prompts and associated responses define the grade of service timers for the DTI card. Group I problems are treated individually. They are bipolar violations, bit error rate (frame alignment) slips and CRC-4 errors.

Group II problems are treated as a group. They are bit 3 of TS0 (far end out of service), bit 6 of TS16 (far end lost multiframe alignment), AIS (alarm indication signal), loss of frame alignment and loss of multiframe alignment.

Responses are interpreted as follows:

- mt = maintenance threshold time.
- ct = new call suppression (hardware service removal) threshold time.
- ot = out of service threshold time.
- dt = no new data calls suppression threshold time.

Each of the response times are expressed as follows:

- nnnY = time in milliseconds where nnnn = 20-5000 (input to nearest 20 milliseconds.)
- nnnS = time in seconds where nnn = 1-240

- nnnM = time in minutes where nnn = 1-240
- nnH = time in hours where nn = 1-24

| Prompt | Response | Description |
|---|---|---|
| CRC | NC mt dt ct ot | Cyclic redundancy check error counts<br>NC=Error count values are in the range 1-255<br>mt = Maintenance threshold time (MNT)<br>dt = No new data calls threshold time (NNDC)<br>ct = No new calls threshold time (NNC)<br>ot = Out of service threshold time (OOS).<br><br>***Note:*** The following requirements must be met for input<br>mt = Maintenance threshold must be equal to or greater than dt.<br>dt = Data calls threshold must be equal to or greater than ct.<br>ct = Calls threshold must be equal to or greater than ot. |
| BPV | NB mt dt ct ot | Bipolar violation error counts<br>NB = Error count values are in the range 1-255<br>mt = Maintenance threshold time (MNT)<br>dt = No new data calls threshold time (NNDC)<br>ct = No new calls threshold time (NNC)<br>ot = Out of service threshold time (OOS).<br><br>***Note:*** The following requirements must be met for this input:<br>mt = >dt = >ct = >ot. |
| FAP | NF mt dt ct ot | Frame alignment problem thresholds<br>NF = Error count values are in the range 1-255<br>mt = Maintenance threshold time (MNT)<br>dt = No new data calls threshold time (NNDC)<br>ct = No new calls threshold time (NNC)<br>ot = Out of service threshold time ***Note:*** The following requirements must be met for this input: mt = >dt = >ct = >ot. |
| SLP | NS mt dt ct ot | Maintenance threshold slip count<br>NS = Error count values are in the range 1-255<br>mt = Maintenance threshold time (MNT)<br>dt = No new data calls threshold time (NNDC)<br>ct = No new calls threshold time (NNC)<br>ot = Out of service threshold time (OOS). |

| Prompt | Response | Description |
|---|---|---|
| GP2 | T2 mt dt ct ot | Group 2 error thresholds.<br>This is the maximum amount of time that can occur before software checks the associated thresholds of 120 to 32,640 msec and rounds it to the closest multiple of 128 msec. T2 error count values are in the range<br>1-(20)-255.<br>NC = Error count values are in the range 1-255<br>mt = Maintenance threshold time (MNT)<br>dt = No new data calls threshold time (NNDC)<br>ct = No new calls threshold time (NNC)<br>ot = Out of service threshold time (OOS).<br>***Note:*** The following requirements must be met for this input:<br>mt = >dt = >ct = >ot. |
| FRFW | YES (NO) | This 2.0 Mb DTI card is (is not) equipped with special Firmware for France. |

LD 73 – Define the 2.0 Mb DTI system timers.

| Prompt | Response | Description |
|---|---|---|
| REQ | NEW<br>CHG | Add or Change Digital Trunk Interface data block |
| TYPE | DTI2 | 2.0 Mb DTI |
| FEAT | SYTI | Change the switch timers and counters for 2.0 Mb DTI. There is only one such block per switch. |
| MAND | 0-(15)-1440 | Maintenance guard time in minutes. |
| NCSD | 0-(15)-1440<br>1S-59S | New call suppression guard time in minutes and seconds. |
| OSGD | 0-(15)-1440 | Out of service guard time in minutes. |
| OOSC | 0-(5)-127 | Out of service occurrences since midnight (DTI disabled). |
| PERS | 0-(100)-254 | Persistence timer in milliseconds for far end problems. |
| DBNC | (10)-32 | Debounce timer in milliseconds |
| CC0 | 1-9 | Card number for clock controller 0. |
| | <CR> | No change for defaults |
| | X | To remove clock controller data |
| PREF CC0 | 1-9 | Slot number of the DTI2 card containing the primary clock reference for the main cabinet (this is the system clock.) |

| Prompt | Response | Description |
|---|---|---|
| SREF CC0 | 1-9 | Slot number of the DTI2 card containing the primary clock reference for the main cabinet. |
| CC1 | 11-19 | Slot number of the DTI2 card containing clock controller 1. |
| PREF CC1 | 11-19 | Slot number of the DTI2 card containing the primary clock reference for the IP expansion cabinet 1. |
| SREF CC1 | 11-19 | Slot number of the DTI2 card containing the secondary clock reference for the IP expansion cabinet 1. |
| CC2 | 21-29 | Card number of for clock controller 2. |
| PREF CC2 | 21-29 | Slot number of the DTI2 card containing the primary clock reference for the IP expansion cabinet 2. |
| SREF CC2 | 21-29 | Slot number of the DTI2 card containing the secondary clock reference for the IP expansion cabinet 2. |
| CC3 | 31-39 | Card number for clock controller 3. |
| PREF CC3 | 31-39 | Slot number of the DTI2 card containing the primary clock reference for the IP expansion cabinet 3. |
| SREF CC3 | 31-39 | Slot number of the DTI2 card containing the secondary clock reference for the IP expansion cabinet 3. |
| CC4 | 41-49 | Card number for clock controller 4. |
| PREF CC4 | 41-49 | Slot number of the DTI2 card containing the primary clock reference for the IP expansion cabinet 4. |
| SREF CC4 | 41-49 | Slot number of the DTI2 card containing the secondary clock reference for the IP expansion cabinet 4. |
| CCGD | 0-(15)-1440 | Clock controller free run guard time in minutes. |
| CCAR | 0-(15) | Clock controller audit rate. The time, in minutes, between normal CC audits. Only programmable on units equipped with 2-Mb DTI.<br><br>***Note 1:*** The clock controller prompts will only appear for clocks which are valid for the machine type being configured. The prompts will only appear if the system is in a valid state for the definition of the 2.0 Mb DTI clock controller data (i.e., the DTI clock references must be unused or in a free-run mode).<br><br>***Note 2:*** Before programming clock controller references, the QPC775 clock controller card(s) must be plugged in, and the switches on the system's QPC441 3 Port Extender appropriately set. Unless this is done, the PREF and SREF prompts are not given. |

LD 16 – Configure the service routes.

| Prompt | Response | Description |
|---|---|---|
| REQ | NEW<br>CHG | Add or Change Route data block |
| TYPE | RDB | Route data block |
| CUST | 0-31 | Customer number |
| ROUT | 0-30 | Route number |
| TKTP | | Service routes allowed with ISDN |
| | TIE<br>COT<br>DID | Tie trunk route<br>Central office trunk<br>Direct Inward Dial trunk |
| RCLS | (EXT)<br>INT | Class marked route as Internal or External |
| DTRK | <br>(NO)<br>YES | Digital trunk route<br>Analog<br>Digital |
| DGTP | DTI2 | Select a digital trunk type of 2.0 Mb DTI |
| ... | | |
| NCNA | YES (NO) | Network Call Name is (is not) allowed |
| NCRD | YES (NO) | Network Call Redirection. Allows network call redirection messages to be sent (or blocks messages if NCRD=no). |
| PTYP | | Port type at far end: |
| | <br>(ATT)<br>AST<br><br>AOT | **Analogue tie trunk routes:**<br>Aanalogue Tie trunk<br>Analogue satellite Meridian 1 Tie trunk or ESN satellite Meridian SL-1 Tie trunk<br>Analogue Tie trunk, used instead of ATT whenever the Meridian 1 has one or more digital satellite trunk routes (DST) to any digital satellite Meridian 1which includes OPX sets |
| | <br>(DTT)<br>DCT<br>DST | **Digital tie trunk routes:**<br>Digital Tie trunk<br>Combination digital Tie trunk<br>Digital satellite Meridian 1 Tie trunk |
| AUTO | YES (NO) | Auto-terminate must be NO if response to DSEL is VOD |
| ICOG | IAO<br>ICT<br>OGT | Incoming and outgoing trunk<br>Incoming trunk<br>Outgoing trunk |

| Prompt | Response | Description |
|---|---|---|
| SRCH | (LIN)<br>RRB | Linear search, or round-robin search used for outgoing trunks |
| ACOD | xxxx | Trunk route access code |
| TARG | 1-15 | Trunk access restriction group for routes |
| OABS | 0-9 | Outgoing digit(s) to be absorbed |
| INST | (0)-999 | Digits to be inserted |
| CNTL | (NO) YES | Changes to controls or timers |
| NEDC | | Near end disconnect control |
| | ETH | Either end control |
| | ORG | Originating end control. Default for TIE, ATVN, DID, and CCSA trunk types |
| FEDC | | Far end disconnect control |
| | ETH | Either end |
| | FEC | Far end |
| | JNT | Joint |
| | (ORG) | Originating end |
| DLTN | YES (NO) | Dial tone on originating calls |
| TIMER | (30)-240 | Network Ring Again duration timer—time is in minutes |
| | | ***Note:*** Package 148, Advanced ISDN Features, is required. |

LD 14 – Define the associated list of service trunks.

| Prompt | Response | Description |
|---|---|---|
| REQ | NEW<br>CHG | Add or Change Trunk data block |
| TYPE | TIE<br>COT<br>DID | Tie trunk route<br>Central Office trunk data block<br>Direct Inward Dial trunk data block |
| CHID | 1-382 | Channel ID for this trunk |
| TN | s c | Terminal Number, where:<br>• s = 1-9 DTI2 card slot number (main cabinet)<br>s = 11-19 DTI2 card slot number (IP expansion cabinet 1)<br>s = 21-29 DTI2 card slot number (IP expansion cabinet 2)<br>s = 31-39 DTI2 card slot number (IP expansion cabinet 3)<br>s = 41-49 DTI2 card slot number (IP expansion cabinet 4)<br>• c = 1-30, 2.0 Mb DTI channel |
| TOTN | s c | New card slot and channel, where:<br>• s = 1-9 DTI2 card slot number (main cabinet)<br>s = 11-19 DTI2 card slot number (IP expansion cabinet 1)<br>s = 21-29 DTI2 card slot number (IP expansion cabinet 2)<br>s = 31-39 DTI2 card slot number (IP expansion cabinet 3)<br>s = 41-49 DTI2 card slot number (IP expansion cabinet 4)<br>• c = 1-30, 2.0 Mb DTI channel |
| PDCA | (1) - 16 | Pad Category Number. This prompt is given if the card is a 2.0 Mb DTI card, or if the card is a 2.0 Mb DTI card and the 1.5/2.0 Mb Gateway feature is equipped. For 2 to 16, the pad category used must already be defined in LD 73. |
| PCML | (MU) A | System PCM law.<br>Prompted if the card is 2.0 Mb DTI, or if the card is a 2.0 Mb DTI card and the 2.0 Mb Gateway feature is equipped. MU, the default, was entered in the PCML prompt in LD 17. |
| CUST | 0-31 | Customer number |

| | | |
|---|---|---|
| NCOS | <br>0-3<br>0-7<br>0-15 | Network class-of-service group number:<br>CDP<br>BARS/NFCR<br>NARS |
| RTMB | 0-127 1-510 | Route number and member number |
| NITE | xxxx | Night-service directory number |
| TGAR | (0)-15 | Trunk group access restriction |
| CLS | | Class-of-service restrictions<br>Note: If DIP option is selected, a new SLCA table must be defined in LD 73. |

# 2.0 Mb PRI Implementation

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## Reference list

The following are the references in this section:

- *Administration* (553-3001-311)
- *Option 11C and 11C Mini Technical Reference Guide* (553-3011-100)
- *Option 11C Planning and Installation* (553-3021-210)

## Overview

This chapter provides the information required to install 2.0 Mb PRI on a Meridian 1 Option 11C system. It includes information for:

- hardware installation
- software programming

With the introduction of Release 25.3x, the 2.0 Mb PRI card is now supported in Option 11C IP expansion cabinets. An IP expansion cabinet is one that contains an IP daughterboard and is connected to the Main cabinet over 100BaseT or F cable.

# Hardware requirements

## Circuit cards

To implement 2.0 Mb PRI on the Meridian 1 Option 11C, an NTAK79 or an NTBK50 PRI card plus associated daughterboards is required.

**Table 7**
**2.0 Mb PRI hardware requirement**

| Circuit card | Description |
|---|---|
| **NTBK50** | 2.0 Mb PRI circuit card<br>Supports the NTAK20 clock controller daughterboard and a D-channel handler interface daughterboard (NTAK93 DCHI or NTBK51 DDCH). |
| **NTAK79** | 2.0 Mb PRI circuit card<br>Supports an on-board clock controller and an on-board D-channel handler interface. |
| **NTAK20** | Clock-controller daughterboard. Option 11C supports only one active clock controller per system and IP Expansion cabinet.<br>*Note:* Every cabinet that contains a digital trunk must contain a clock controller.<br>Connects to the NTBK50 PRI card |
| **NTAK93** | D-channel-handler interface (DCHI) daughterboard<br>Connects to the NTBK50 PRI card. |
| **NTBK51** | Downloadable D-channel daughterboard (DDCH).<br>Connects to the NTBK50 PRI card. |

### Cables

The following cables are required for PRI connections:

- CEPT Cable - NTBK05DA (120 ¾ twisted pair—6.15 m length)

**or**

- CEPT Cable - NTBK05CA (75 ¾ coaxial—6.15 m length)

# Hardware description

## 2.0 Mb PRI cards

Two PRI cards are available on the Option 11C system:

- NTAK79 2.0 Mb PRI card
- NTBK50 2.0 Mb PRI card

The difference between the two PRI cards is the ability of the NTBK50, when equipped with the NTBK51 D-channel daughterboard, to download software onto the card. This feature is based on the MSDL platform and essentially replaces the D-channel circuit on the NTAK79 PRI card. (The NTAK79 PRI card does not support the NTBK51 Downloadable D-channel handler daughterboard.)

A second difference between the NTAK79 and NTBK50 2.0 Mb PRI cards is that the NTAK79 has an on-board clock controller while the NTBK50 supports the NTAK20 clock controller daughterboard.

> ***Note:*** If the NTAK93 D-channel daughterboard is attached to the NTBK50 PRI card instead of the NTBK51 Downloadable D-channel daughterboard, the NTBK50 PRI card functions in the same manner as the NTAK79 PRI card.

### NTAK79 2.0 Mb PRI circuit card

The 2.0 Mb Primary Rate Interface card provides the physical interface for the digital E-1 carrier on the Option 11C system. The card includes an on-board clock controller and on-board D-channel handler. It is installed in slots 1 through 9 in the main cabinet. On IP Expansion cabinets, it may be placed in slots 11-19, 21-29, 31-39, 41-49 of the first, second, third, and fourth expansion cabinets, respectively.

For information on the NTAK79 faceplate LEDs, refer to "PRI Maintenance" on page 85 of this guide.

### NTBK50 2.0 Mb PRI circuit card

The 2.0 Mb Primary Rate Interface card provides the physical interface for the digital E-1 carrier on the Option 11C system. The card is installed in slots 1 through 9 in the main cabinet. On IP Expansion cabinets, it may be placed in slots 11-19, 21-29, 31-39, 41-49 of the first, second, third, and fourth expansion cabinets, respectively.

The NTBK50 supports the following clock controller and D-channel handler daughterboards:

- NTAK20 clock controller daughterboard
- NTAK93 D-channel handler daughterboard, or NTBK51 Downloadable D-channel daughterboard.

If the NTAK93 D-channel daughterboard is attached, the NTBK50 PRI card functions in the same manner as the NTAK79 PRI card. If the NTBK51 D-channel daughterboard is attached, software is downloaded to the card instead of residing in a D-channel circuit.

For information on the NTBK50 faceplate LEDs, refer to "PRI Maintenance" on page 85 of this guide.

## NTAK20 Clock Controller (CC) daughterboard

The NTAK20 Clock Controller daughterboard is used with the NTBK50 2.0 Mb PRI card. (The NTAK79 PRI card has an *on-board* clock controller).

Digital Trunking requires synchronized clocking so that a shift in one clock source will result in an equivalent shift of the same size and direction in all parts of the network. On Option 11C systems, synchronization is accomplished with the NTAK20 clock controller circuit card.

**IMPORTANT**

Every cabinet that contains a digital trunk must contain a clock controller. If a system is equipped with digital trunks, it is recommended that at least one digital trunk be placed in the main cabinet. If there is a mixture of TMDI and non-TMDI in the same cabinet, place the clock controller on the non-TMDI card.

The Clock Controller circuitry synchronizes the Option 11C to an external reference clock, and generates and distributes the clock to the system. Option 11C can function either as a slave to an external clock or as a clocking master. The NTAK20AB version of the clock controller meets AT&T Stratum 3 and Bell Canada Node Category D specifications. The NTAK20BB version meets CCITT stratum 4 specifications.

### Shelf slot assignment

On non-CISPR B system cabinets, the NTAK20 may be placed in slots 1-9. On cabinets NTAK11Dx and NTAK11Fx, the active NTAK20 must be placed in slots 1-3 (slots 4-10 may not be used.) On IP Expansion cabinets, the NTAK20 may be placed in slots 11-19, 21-29, 31-39, 41-49 of the first, second, third, and fourth expansion cabinets, respectively.

## NTAK93 D-Channel Handler Interface (DCHI) daughterboard

The NTAK93 DCHI daughterboard interfaces with the Meridian 1 Option 11C Central Processing Unit (CPU) and mounts on the NTBK50 PRI card for PRI (but not ISL) applications. The equivalent circuit is contained on-board the NTAK79 2.0 Mb PRI card.

The DCHI is responsible for performing the Q.921 layer 2 protocol information. It transfers layer 3 signaling information between two adjacent network switches.

The NTAK93 DCH daughterboard, when installed on the NTBK50 circuit card, is addressed in the same slot as the NTBK50.

A minimum of one NTAK93 is required for each PRI link. If more than one PRI link is connected to the same end location, a single DCHI circuit card can support up to a maximum of 8 PRI connections for the Option 11C system. This allows for the support of 240 B-Channels or PRI trunks.

### NTBK51 Downloadable D-Channel daughterboard

The NTBK51 DDCH daughterboard interfaces with the Meridian 1 Option 11C Central Processing Unit (CPU) and mounts on the NTBK50 2.0 Mb PRI circuit card for PRI D-Channel applications. The DDCH is equivalent to the MSDL card used on the larger Meridian 1 systems, but it only supports D-channel applications (no SDI or ESDI).

The NTBK51 DDCH daughterboard, when installed on the NTBK50 circuit card, is addressed in the same slot as the NTBK50.

A minimum of one NTBK51 is required for each PRI link. If more than one PRI link is connected to the same end location, a single DDCH circuit card can support up to a maximum of 8 PRI connections for the Option 11C system. This allows for the support of 240 B-channels or PRI trunks.

## Install the NTAK79 PRI card

The steps required to install PRI are as follows:

**1** Inspect the PRI card.

**2** Set the switches on the PRI card.

**3** Insert the PRI card in slots 1-9 of the Main cabinet, or in slots 11-19, 21-29, 31-39, 41-49 of the first, second, third, and fourth Expansion cabinets, respectively.

**4** Connect the cables.

Each of these steps is described in the pages that follow. The PRI hardware installation procedure is the same regardless of the type of system at the far end (i.e. another Meridian 1, AXE-10, SYS-12, etc.).

## Inspect the NTAK79 circuit card

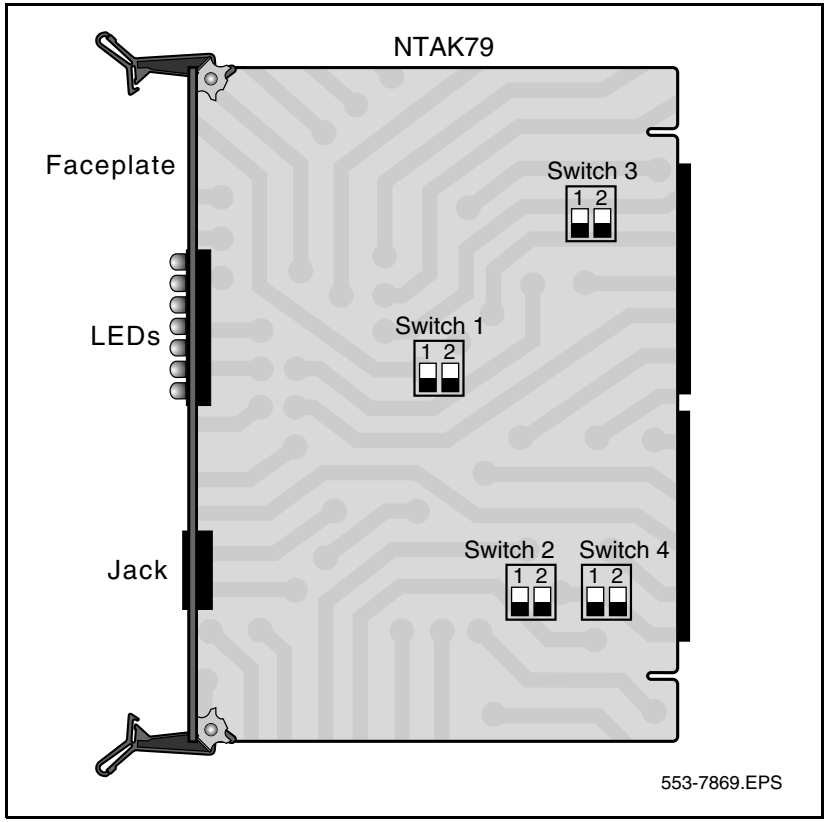
- Locate the NTAK79 2.0 Mb circuit card and carefully remove it from its packaging.
- Inspect the circuit card for any visible damage which may have occurred during shipping.

## Set the switches on the NTAK79

The NTAK79 incorporates four on-board dip switches. The tables that follow provide information on the various settings and related functions of these switches.

***Note:*** The ON position for all the switches is towards the bottom of the card. This is indicated by a white dot printed on the board adjacent to the bottom left corner of each individual switch.

**Figure 2**
**NTAK79 with Switch locations**




Set the switches found on the circuit card as per the requirements of your specific installation:

### Switch SW1—DCHI Configuration

This switch enables/disables the on-board DCHI and sets the operating mode of the DCHI.

For the U.K., use DPNSS1 mode. For all other countries, use Q.931 mode.

**Table 8**
**Switch SW1**

| Switch | Down (On) | Up (Off) |
|---|---|---|
| SW 1-1 | enable DCHI | disable DCHI |
| SW 1-2 | DPNSS1/DASS2 | Q.931 |

### Switch SW2—Carrier Impedance Configuration

This switch sets the carrier impedance to either 120¾ or 75¾. Twisted pair cable is usually associated with 120¾. Coaxial cable is usually associated with the 75¾ setting.

**Table 9**
**Switch SW2**

| Cable Type | SW 2-1 | SW 2-2 |
|---|---|---|
| 75¾ | Up (Off) | Down (On) |
| 120¾ | Down (On) | Up (Off) |

### Switch SW3—Clock Controller Configuration

This switch enables/disables (H/W) the on-board Clock Controller. SW 3-2 should be disabled if the on-board clock controller is not in use.

**Table 10**
**Switch SW3**

| Switch | Down (On) | Up (Off) | Note |
|---|---|---|---|
| SW 3-1 | — | — | Spare |
| SW 3-2 | Disabled | Enabled | |

### Switch SW4—Carrier Shield Grounding

This switch allows for the selective grounding of the Tx / Rx pairs of the carrier cable. Closing the switch (down position) applies Frame Ground (FGND) to the coaxial carrier cable shield, creating a 75¾ unbalanced configuration. This applies only to the NTBK05CA cable.

**Table 11**
**Switch SW4**

| Switch | Down (On) | Up (Off) |
|---|---|---|
| SW 4-1 | Rx—FGND | Rx—OPEN |
| SW 4-2 | Tx—FGND | Tx—OPEN |

***Note:*** The usual method is to ground the outer conductor of the receive coax signal.

## Insert the NTAK79

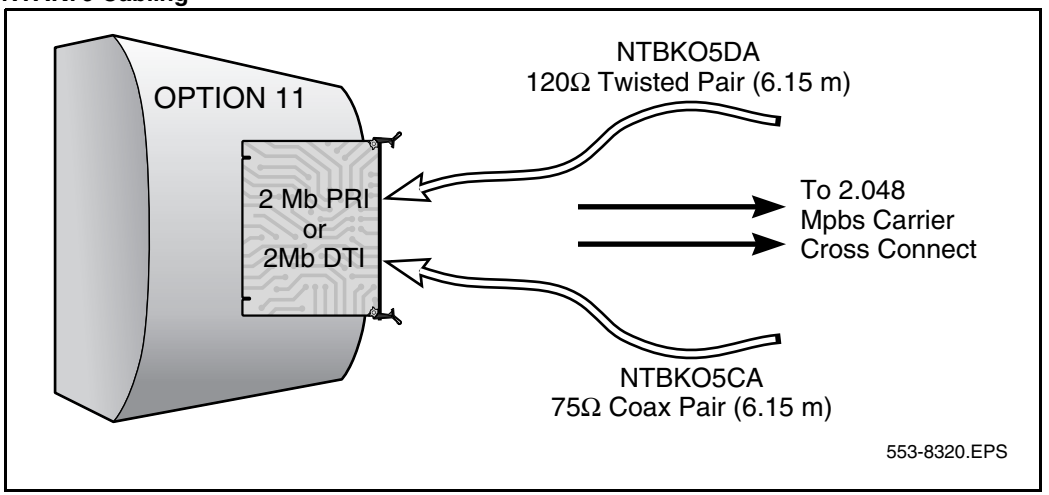
Slide the circuit card into any unused card slot 1 through 9 in the main cabinet, or in slots 11-19, 21-29, 31-39, 41-49 of the first, second, third, and fourth IP Expansion cabinets, respectively. Secure the circuit card in the cabinet by locking the lock latch assemblies. The card number associated with a 2.0 Mb PRI card is based on the slot in which the card is installed.

## Connect the cables

Follow the instructions below to connect cables to the NTAK79 PRI card. Also, refer to Figure 3.

- In the cabling area, located directly below the card cage, remove the retaining bar used to secure the MDF cables. Connect the NTBK05DA/CA interface cable to the 50 pin Amphenol connector below the slot in which the NTAK79 is installed. Re-install the retaining bar to secure the cable(s) in place.
- Terminate the NTBK05DA/CA carrier cable as required.

**Figure 3**
**NTAK79 Cabling**




### NTBK05DA pinouts

The pinouts for the NTBK05DA cable are as follows:

**Table 12**
**NTBK05DA pinouts**

| From: 50 pin MDF connector | To: 9 pin connector | Colour | Signal |
|---|---|---|---|
| pin 23 | pin 6 | Black | R0 |
| pin 48 | pin 7 | White | T0 |
| pin 50 | pin 9 | Bare | R0/T0 FGND |
| pin 24 | pin 2 | Black | R1 |
| pin 49 | pin 3 | Red | T1 |
| pin 25 | pin 5 | Bare | R1/T1 FGND |

### NTBK05CA pinouts

The pinouts for the NTBK05CA cable are as follows:

**Table 13**
**NTBK05CA pinouts**

| From: 50 pin MDF connector | To: Transmit coax connector | To: Receive coax connector | To: 50 pin MDF connector |
|---|---|---|---|
| pin 23 | Inner conductor | — | — |
| pin 48 | outer conductor | — | — |
| pin 24 | — | Inner conductor | — |
| pin 49 | — | outer conductor | — |

## Install the NTBK50 PRI card

The NTBK50 serves as a motherboard to the NTAK20 clock controller, and either the NTBK51 Downloadable D-channel handler or the NTAK93 D-channel handler.

The steps required to install PRI are as follows:

**1** Inspect the PRI card and daughterboards

**2** Set the switches on the PRI card

**3** Mount the daughterboard(s) on the PRI card

**4** Insert the PRI card in the main cabinet and any IP expansion cabinets

**5** Connect the cables

Each of these steps is described in the pages that follow. The PRI hardware installation procedure is the same regardless of the type of system at the far end.

## Inspect the NTBK50 circuit card

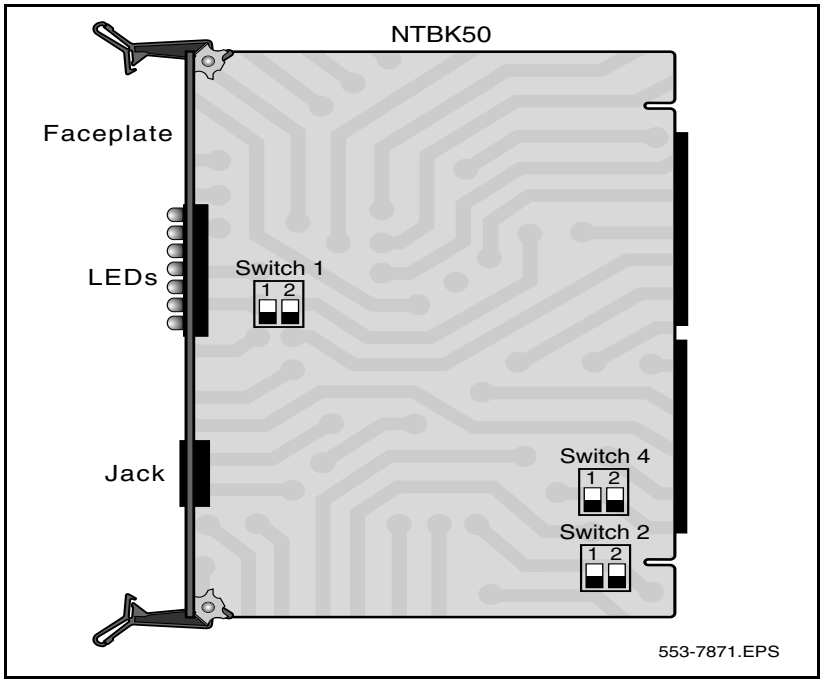
- Locate the NTBK50 2.0 Mb circuit card plus associated daughterboard(s) and carefully remove them from their packaging.
- Inspect the circuit cards for any visible damage which may have occurred during shipping.

## Set the switches on the NTBK50

The NTBK50 incorporates three on-board dip switches. The following tables provided information on the various settings and related functions of these switches.

***Note:*** The ON position for all the switches is towards the bottom of the card. This is indicated by a white dot printed on the board adjacent to the bottom left corner of each individual switch.

**Figure 4**
**NTBK50 with switch locations**



Set the switches found on the circuit card as per the requirements of your specific installation.

### Switch SW1—DCHI Configuration (NTAK93 only)

This switch enables/disables the DCHI and sets the operating mode of the DCHI. It is only used if an NTAK93 D-channel handler daughterboard is being used. It has no effect when using the NTBK51 DDCH daughterboard.

For the U.K., use DPNSS1 mode. For all other countries, use Q.931 mode.

**Table 14**
**Switch SW1**

| Switch | Down (On) | Up (Off) |
|---|---|---|
| SW 1-1 | — | — |
| SW 1-2 | DPNSS1/DASS2 | Q.931 |

### Switch SW2—Carrier Impedance Configuration

This switch sets the carrier impedance to either 120¾ or 75¾. Twisted pair cable is usually associated with 120¾. Coaxial cable is usually associated with the 75¾ setting.

**Table 15**
**Switch SW2**

| Cable Type | SW 2-1 |
|---|---|
| 75¾ | Down (On) |
| 120¾ | Up (Off) |

### Switch SW4—Carrier Shield Grounding

This switch allows for the selective grounding of the Tx and/or Rx pairs of the carrier cable. Closing the switch (down position) applies Frame Ground (FGND) to the coaxial carrier cable shield, creating a 75¾ unbalanced configuration. This applies only to the NTBK05CA cable.

**Table 16**
**Switch SW3**

| Switch | Down (On) | Up (Off) |
|---|---|---|
| SW 4-1 | Rx—FGND | Rx—OPEN |
| SW 4-2 | Tx—FGND | Tx—OPEN |

***Note:*** The usual method is to ground the outer conductor of the receive coax signal.

## Mount the daughterboards on the NTBK50

Use the following procedure to mount and remove the NTAK20 CC and the NTBK51 DDCH or NTAK93 DCHI daughterboards onto the NTBK50 PRI.

Install the NTAK93 or NTBK51 daughterboard before the NTAK20 daughterboard. Work on a flat surface when mounting or removing daughterboards.

**1** Visually inspect the connector pins on the underside of the daughterboard. Any pins that are bent should be re-aligned prior to mounting.

**2** Place the NTBK50 down flat on an anti-static pad.

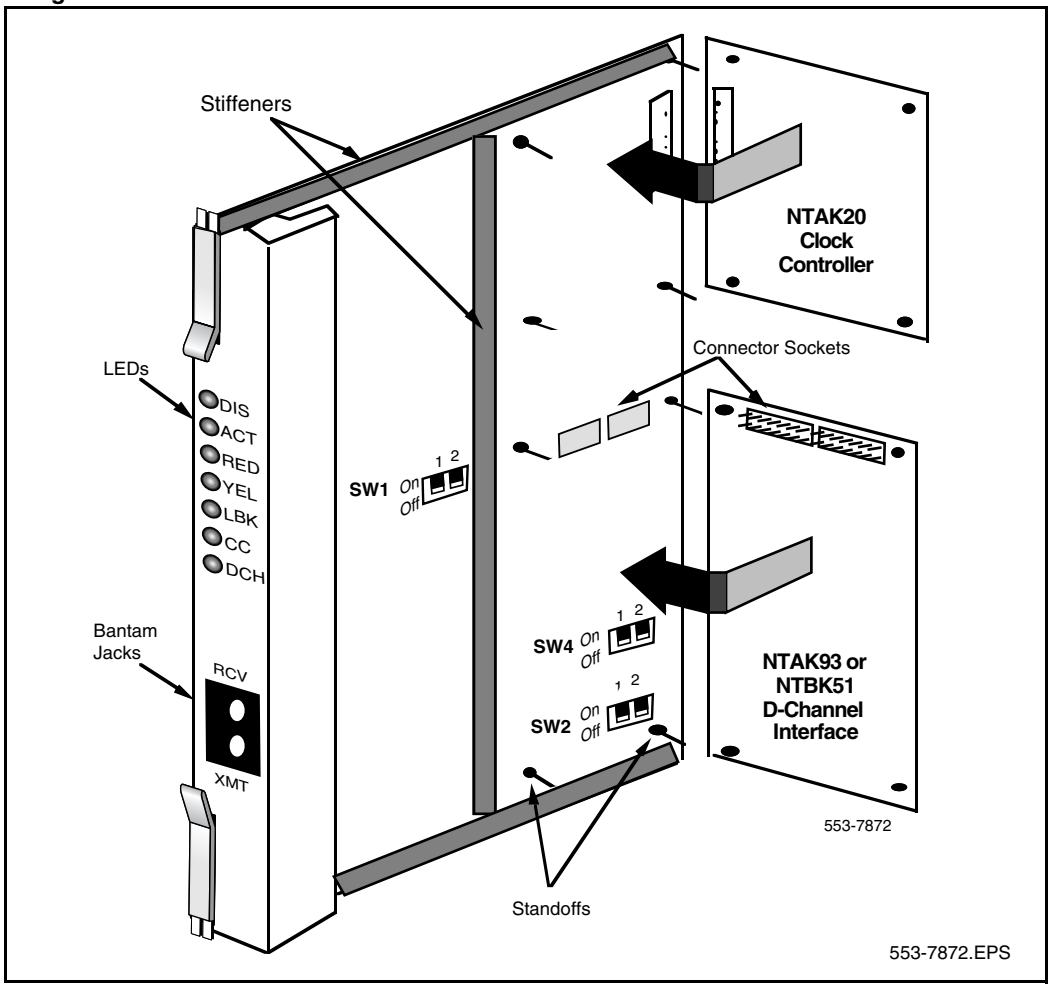
**3** From an overhead viewpoint, with the daughterboard parallel above the NTBK50 and the connector pins aligned over the connector sockets, line up the mounting holes on the daughterboard with the tops of the standoffs on the NTBK50 (see Figure 5 on page 51).

**4** Slowly lower the daughterboard towards the NTBK50, keeping the standoffs in line with all four holes, until the holes are resting on the tops of the four standoffs.

If more than a very slight amount of pressure is required at this point, the connector pins may not be aligned with the connector socket. If so, lift the daughterboard off the NTBK50 and return to step 2.

**5** Gently apply pressure along the edge of the board where the connector is located until the standoffs at the two corners adjacent to the connector snap into a locked position. Then press down on the two corners on the opposite side until they also are locked into place.

**Figure 5**
**Daughterboard installation**



### Remove the daughterboards from the NTBK50

Use these guidelines to remove the NTAK20 and NTBK51 or NTAK93 from the NTBK50 PRI card. Because of the physical layout of the mother and daughterboards, the NTAK20 should be removed before the NTAK93 or NTBK51.

1. Starting at the two corners opposite the connector, gently lift each corner out of the locking groove of the standoff.
2. At the two corners adjacent to the connector, gently lift the entire side until the mounting holes are clear of the locking groove of the standoff.
3. To remove the connector pins, grasp the edge of the board adjacent to the connector and lift gently.

If more than one NTBK50 card is installed, the additional cards may not carry daughterboards, depending on the system configuration. At least one NTAK20 (per system) is always required.

## Insert the NTBK50

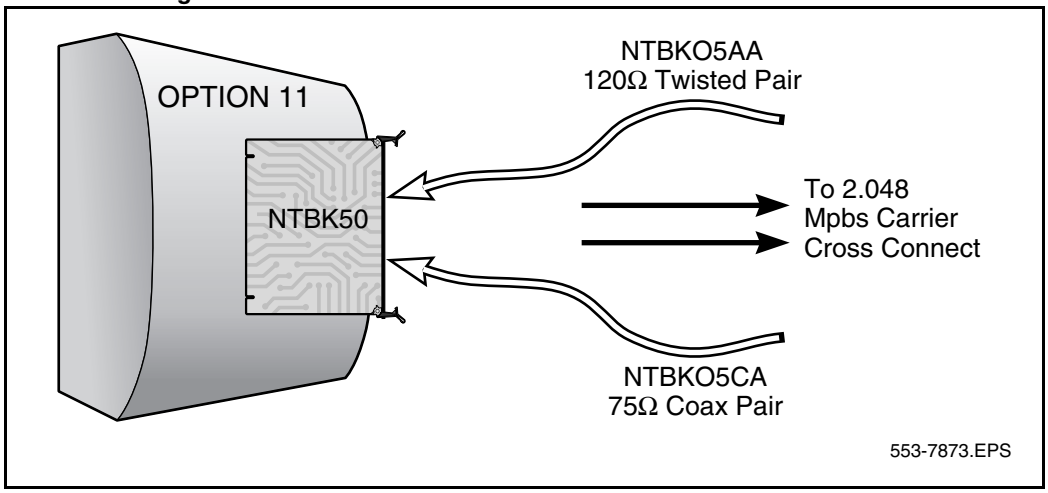
Slide the circuit card into any unused card slot 1 through 9 in the main cabinet, or in slots 11-19, 21-29, 31-39, 41-49 of the first, second, third, and fourth IP xpansion cabinets, respectively. Secure the circuit card in the cabinet by locking the lock latch assemblies. The card number associated with a 2.0 Mb PRI card is based on the slot in which the card is installed.

## Connect the cables

Follow the instructions below to connect cables to the NTBK50 PRI card. Also, refer to Figure 6.

- In the cabling area, located directly below the card cage, remove the retaining bar used to secure the MDF cables. Connect the NTBK05DA/CA interface cable to the 50 pin Amphenol connector below the slot in which the NTBK50 is installed. Re-install the retaining bar to secure the cable(s) in place.
- Terminate the NTBK05DA/CA carrier cable as required.

**Figure 6**
**NTBK50 Cabling**




### NTBK05DA pinouts

The pinouts for the NTBK05DA cable are as follows:

**Table 17**
**NTBK05DA pinouts**

| From: 50 pin MDF connector | To: 9 pin connector | Colour | Signal |
|---|---|---|---|
| pin 23 | pin 6 | Black | R0 |
| pin 48 | pin 7 | White | T0 |
| pin 50 | pin 9 | Bare | R0/T0 FGND |
| pin 24 | pin 2 | Black | R1 |
| pin 49 | pin 3 | Red | T1 |
| pin 25 | pin 5 | Bare | R1/T1 FGND |

### NTBK05CA pinouts

The pinouts for the NTBK05CA cable are as follows:

**Table 18**
**NTBK05CA pinouts**

| From: 50 pin MDF connector | To: Transmit coax connector | To: Receive coax connector | To: 50 pin MDF connector |
|---|---|---|---|
| pin 23 | Inner conductor | — | — |
| pin 48 | outer conductor | — | — |
| pin 24 | — | Inner conductor | — |
| pin 49 | — | outer conductor | — |

# PRI software programming

The following information describes the process required to program basic 2.0 Mb PRI on the Meridian 1 Option 11C.

PRI cards must be configured before defining the DCH links or PRI applications.

Prompts which do not show a response can be left as default. For more information on any of these prompts, refer to *Administration* (553-3001-311).

## Task summary list

***Note:*** Before installing PRI cards in IP expansion cabinets, first configure the expansion cabinets for IP connectivity. Refer to Overlay 117 in the *Meridian 1 Software input/output guide*(553-3001-511) for further information.

The following is a summary of the tasks in this section:

**1** LD 17 – Add a PRI card.

**2** LD 17– Add a DCHI or DDCH.

**3** LD 15 – Define a PRI customer.

**4** LD 16 – Define a PRI service route.

**5** LD 14 – Define service channels and PRI trunks.

**6** LD 73 – Define system timers and clock controller parameters.

**7** LD 73 – Define PRI parameters and thresholds.

**8** LD 73 – Change trunk pad category values.

**LD 17** – Add a PRI card.

| Prompt | Response | Description |
|---|---|---|
| REQ | CHG | Change data |
| TYPE | CFN | Configuration data block |
| CEQU | YES | Changes to common equipment |
| PRI2 | XX | The PRI2 digital card number, where:<br>xx = 1-9 (main cabinet), 11-19 (IP expansion cabinet 1), 21-29 (IP expansion cabinet 2), 31-39 (IP expansion cabinet 3), 41-49 (IP expansion cabinet 4.) |

**LD 17**– Add a DCHI or DDCH.

| Prompt | Response | Description |
|---|---|---|
| REQ | CHG | Change data. |
| TYPE | CFN | Configuration data block. |
| ADAN | NEW DCH xx<br>CHG DCH xx<br>OUT DCH xx | Add a primary D-channel (any unused SDI port.)<br>Change a primary D-channel.<br>Out the primary D-channel, where:<br>xx = 1-9 for main cabinet, 11-19 for IP expansion cabinet1, 21-29 for IP expansion cabinet 2, 31-39 for IP expansion cabinet 3, and 41-49 for IP expansion cabinet 4. |
| CTYP | MSDL<br>TMDI | Card type where:<br>MSDL = The NTBK51BA Downloadable D-Channel Daughterboard.<br>TMDI = TMDI (NTRB21) card. |
| CDNO | 1-50 | Card slot number to be used as the primary DDCH/DCHI.<br>Card slots 10, 20, 30, 40, and 50 are only applicable for D-channel configuration of ISL or VNS. |
| PORT | 1 | PORT must be set to "1" |

| Prompt | Response | Description |
|---|---|---|
| USR | PRI | D-channel is for ISDN PRI only.<br>***Note:*** 2.0 Mb only supports PRI or SHA user mode. |
| IFC | xx | Interface type. |
| DCHL | xx | PRI card number which will be carrying the D-channel. Must match entry made for the "CDNO" associated with the "DCHI" prompt above.<br>xx = 1-9 for main cabinet, 11-19 for IP expansion cabinet1, 21-29 for IP expansion cabinet 2, 31-39 for IP expansion cabinet 3, and 41-49 for IP expansion cabinet 4. |
| PRI2 | <CR> | Additional PRI Loops controlled by this DCHI. Remember one DCHI can control up to 16 PRI loops going to the same destination. For the Option 11C system, the maximum limit is eight loops. |
| OTBF | 1-(16)-127 | Number of output request buffers. Note: for a single PRI link, leave this prompt at default (16). Add 5 output request buffers per additional link. |
| SIDE | NET (USR) | Prompted only if IFC is set to SL1.<br>NET = network, the controlling switch<br>USR = slave to the controller |
| RLS | XX | Software release of far-end. This is the current software release of the far end. If the far end has an incompatible release of software, it prevents the sending of application messages, e.g. for Network Ring Again. |
| RCAP | MSL | MSDL RCAP capability. |
| OVLR | <CR> | Allow or disallow overlap receiving on a D-channel. Default is NO. |
| LAPD | YES (NO) | Change LAPD parameters. Enter carriage return if timers are to be left at default. The following timers are prompted only if LAPD is set to YES. (They can all be left at default during initial set-up.) |
| - T23 | 1-(20)-31 | Interface guard timer checks how long the interface takes to respond. In units of 0.5 seconds (default 20 = 10 seconds). |
| T200 | 2-(3)-40 | Retransmission timer in units of 0.5 seconds (default 3 = 1.5 seconds). |
| - N200 | 1-(3)-8 | Maximum number of retransmissions |

| Prompt | Response | Description |
|---|---|---|
| - N201 | 4(260) | Maximum number of octets in information field |
| - K | 1-(7)-32 | Maximum number of outstanding unacknowledged frames (NAKS) |

**LD 15** – Define a PRI customer.

| Prompt | Response | Description |
|---|---|---|
| REQ: | NEW<br>CHG | Add new data<br>Change existing data |
| TYPE | NET | Networking data |
| CUST | 0-31 | Customer number |
| LDN | XXXX | Enter the customer's Listed Directory Number |
| AC2 | | Access Code 2. Enter call types (type of number) that use access code 2. Multiple responses are permitted. This prompt only appears on NARS equipped systems. If a call type is not entered here, it is automatically defaulted to access code 1. |
| | NPA | E.164 National |
| | NXX | E.164 Subscriber |
| | INTL | International |
| | SPN | Special Number |
| | LOC | Location Code |
| ISDN | YES | Customer is equipped with ISDN |
| PNI | 1-32700 | Customer private network identifier. This number must be unique to this customer in the private network. e.g. it is used as part of the setup message for feature operation such as Network Ring Again, Network ACD....Note that if set to zero (0), NRAG and NACD will not work. |
| HNPA | NPA | Telephone area code for this Meridian 1. Sent as part of setup message as calling line identification. |
| HNXX | NXX | Telephone local exchange code for this Meridian 1. Sent as part of setup message as calling line identification. |
| HLOC | XXX | Home location code (NARS) |
| LSC | 1-9999 | One to four digit Local Steering Code established in the Coordinated Dialing Plan (CDP). The LSC prompt is required for Calling Line I.D. and Network ACD. |

**LD 16** – Define a PRI service route.

| Prompt | Response | Description |
|---|---|---|
| REQ | NEW<br>CHG | Add new data<br>Change existing data |
| TYPE | RDB | Route data block |
| TKTP | xxx | Trunk type. |
| DTRK | YES | Digital trunk route |
| DGPT | PRI2 | 2.0 Mb PRI. Prompted only if PRA = YES in LD15. |
| ISDN | YES | ISDN option |
| MODE | PRI | Route used for PRI only |
| PNI | 1-32700 | Customer private network identifier-must be the same as the CDB PNI at far end. |
| IFC | xx | Interface type. |
| CHTY | BCH | Signaling type- prompted if DTRK is YES. D-channel signaling for B-channels. |
| CTYP | aaa<br><CR> | Call Type. Enter the call type to be associated with the outgoing route for direct dialing using the trunk access code (instead of NARS access code). |
| INAC | YES | Insert Access Code. Permits the NARS AC1 or AC2 access code to be re-inserted automatically on an incoming ESN call. This prompt only appears on a TIE route and must be set to "YES" in order for features such as Network ACD to function.<br><br>On an existing ESN network, setting this prompt to "YES" may also require modifying the Digit Manipulation Index (DMI) associated with this route at the far end (so that the Access Code does not get re-inserted twice). The INSERT prompt (INST) is bypassed if INAC is set to YES. |

**LD 14** – Define service channels and PRI trunks.

| Prompt | Response | Description |
|---|---|---|
| REQ | NEW<br>CHG | Add new data<br>Change existing data<br><br>***Note:*** When assigning several members at once use the multiple create command NEW XX. |
| TYPE | TIE | TIE trunk only, allowed between MSL-1. |

| | | |
|---|---|---|
| TN | c ch | Enter the PRI trunk card (c) and channel number (ch).<br>c = 1-9 for main cabinet, 11-19 for IP expansion cabinet 1, 21-29 for IP expansion cabinet 2, 31-39 for IP expansion cabinet 3, and 41-49 for IP expansion cabinet 4.<br>ch = 1-30 |
| RTMB | 0-127 1-510 | Route number and member number |
| ... | | |

**LD 73** – Define system timers and clock controller parameters.

| Prompt | Response | Description |
|---|---|---|
| REQ | CHG | Change data |
| TYPE | PRI2 | 2.0 Mb PRI |
| FEAT | SYTI | System timers |
| CC0 | 1-9 | Card slot number for Clock Controller 0. |
| PREF CCO | 1-9 | Card slot number of PRI2 card containing the prImary clock reference for the Main cabinet (this is the system clock.) |
| SREF CC0 | 1-9 | Card slot number of PRI2 card containing the secondary clock reference for the Main cabinet (this is the system clock.) |
| CC1 | 11-19 | Card slot number for Clock Controller 1. |
| PREF CC1 | 11-19 | Card slot number of PRI2 card containing the prImary clock reference for IP Expansion cabinet 1. |
| SREF CC1 | 11-19 | Card slot number of PRI2 card containing the secondary clock reference for IP Expansion cabinet 1. |
| CC2 | 21-29 | Card slot number for Clock Controller 2. |
| PREF CC2 | 21-29 | Card slot number of PRI2 card containing the prImary clock reference for IP Expansion cabinet 2. |
| SREF CC2 | 21-29 | Card slot number of PRI2 card containing the secondary clock reference for IP Expansion cabinet 2. |
| CC3 | 31-39 | Card slot number for Clock Controller 3. |
| PREF CC3 | 21-29 | Card slot number of PRI2 card containing the prImary clock reference for IP Expansion cabinet 3. |
| SREF CC3 | 31-39 | Card slot number of PRI2 card containing the secondary clock reference for IP Expansion cabinet 3. |
| CC4 | 41-49 | Card slot number for Clock Controller 4. |

| | | |
|---|---|---|
| PREF CC4 | 41-49 | Card slot number of PRI2 card containing the prImary clock reference for IP Expansion cabinet 4. |
| SREF CC4 | 41-49 | Card slot number of PRI2 card containing the secondary clock reference for IP Expansion cabinet 4. |
| CCAR | 0-(15) | Clock Controller Audit Rate.<br>Enter the time (in minutes) between normal CC audits. |

**LD 73** – Define PRI parameters and thresholds.

| Prompt | Response | Description |
|---|---|---|
| REQ | CHG | Change data |
| TYPE | PRI2 | 2.0 Mb PRI |
| FEAT | LPTI | |
| LOOP | X | X is the slot number of the 2.0 Mb PRI card. |
| MFF | AFF (CRC) | Alternate mode or CRC multi-frame mode |
| ALRM | (REG) ALT | Default or alternate alarms selected |
| G10S | | |
| SLP | mc mt oc ot | Slip error count,<br>mc = Maintenance threshold slip count, 1- (5)-255<br>mt = Maintenance threshold time, default 24 hours, see Note after Step 3<br>oc = Out-of-service threshold slip count, 1-(30)-255<br>ot = Out of service threshold time, default 1 hour, see Note after Step 3 |
| BPV | n1 n2 | Bipolar violation error count, 1-(128)-255 for n1, 1-(122)-255 for n2.<br>n1 is multiplied by 16 to obtain the actual count, giving an actual count range of 16-4080. |
| CRC | n1 n2 | Cyclic redundancy check error count 1-(201)-255 for n1, 1-(97)-255 for n2.<br>n1 is multiplied by 4 to obtain the actual count, giving an actual count range of 4-1020. |
| FAP | n1 n2 | Frame alignment problem error count 1-(28)-255 for n1, (1)-255 for n2. |
| RATS | 1-(10)-15 | Number of seconds firmware has to check BPV/CRC/FAP for excessive error rate. |

| Prompt | Response | Description |
|---|---|---|
| GP2 | T2 mt dt ct ot | Group 2 error thresholds.<br>This is the maximum amount of time that can occur before software checks the associated thresholds of 120 to 32,640 msec and rounds it to the closest multiple of 128 msec.<br><br>T2 = Error count values are in the range 1-(20)-255<br>mt = Maintenance threshold time (MNT)(default =100S)<br>dt = No new data calls threshold time (NNDC)(default =12S)<br>ct = No new calls threshold time (NNC)(default =12S)<br>ot = Out of service threshold time (OOS)(default =4S).<br><br>***Note:*** The following requirements must be met for input mt = >dt = >ct = >ot.<br><br>***Note:*** Threshold times must be one of the following nnnnT, nnnS, nnnM, or nnH, where nnnn is and integer and T,S,M, or H show the increments of use. The values are as follows. 10/09/91<br>-nnnnT is the time in 20 millisecond increments (nnnn= 20-5000)<br>-nnnS is the time in 1 second increments (nnn= 1-240)<br>- nnnM is the time in 1 minute increments (nnn= 1-240)<br>- nnH is the time in 1 hour increments (nn= 1-24) |
| MNG1 | nnnM | Maintenance Guard time Group 1<br>default = 15M |
| NCG1 | nnnM | No New Calls Guard time Group 1<br>default = 15M |
| OSG1 | nnnM | Out Of Service Guard time Group 1<br>default = 15M |
| MNG2 | nnnS | Maintenance Guard time Group 2<br>default = 15S |
| NCG2 | nnnS | No New Calls Guard time Group 2<br>default = 15S |
| OSG2 | nnnS | Out Of Service Guard time Group 2<br>default = 15S |
| PERS | ttt | Persistence Timer for Group II problems.<br>Enter 0 - 256 msec in increments of 2 msec.<br>Default is 50 (=100ms). |
| CLRS | ttt | Clearance Timer for Group II problems. Enter 0 - 256 msec in increments of 2 msec.<br>Default is 50 (=100ms). |
| OOSC | nnn | Out of Service Counter.<br>Range for nnn of 0-255 with a default of 5. |

**LD 73** – Change trunk pad category values.

| Prompt | Response | Description |
|---|---|---|
| REQ | CHG | Change data |
| TYPE | PRI2 | 2.0 Mb PRI |
| FEAT | PADS | |
| PDCA | # | PAD table-0 is default and is hard coded |
| The following prompts define the pad levels.<br>The receiving pad code is *r* and the transmission pad code is *t*. These entries have the range 0-15. The pad values (in decibels) relating to these codes are shown after this table. | | |
| ONP | r t | On-premises extension |
| DSET | r t | Meridian Digital set<br>(prompted only if the 2.0 Mb Gateway feature is equipped |
| OPX | r t | Off-premises extension |
| DTT | r t | Digital TIE trunks |
| SDTT | r t | Digital Satellite TIE trunks |
| NTC | r t | Nontransmission compensated |
| TRC | r t | Transmission compensated |
| DCO | r t | Digital COT, FEX, WAT, and DID trunks |
| VNL | r t | Via Net Loss |
| DTO | r t | 2.0 Mb PRI2 digital TOLL office trunks |
| ACO | r t | Analog CO or WATS trunks |
| AFX | r t | Analog FEX trunks |
| ADD | r t | Analog DID trunks |
| SATT | r t | Analog satellite TIE trunks |
| ATO | r t | Analog TOLL office trunks |
| PRI2 | r t | 2.0 Mb PRI trunk<br>(prompted only if the 1.5/2.0 Mb Gateway feature is equipped and TYPE=2.0 Mb PRI) |
| XUT | r t | Analog CO trunk<br>(prompted only if the 1.5/2.0 Mb Gateway feature is equipped and TYPE=PRI2) |
| XEM | r t | Analog TIE trunk<br>(prompted only if the 1.5/2.0 Mb Gateway feature is equipped and TYPE=PRI2) |

Table 19 shows the pads available to 2.0 Mb PRI. Positive dB represents loss and negative dB represents gain.

**Table 19**
**Pad Values**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **code** | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| **value (dB)** | 0.0 | +1.0 | +2.0 | +3.0 | +4.0 | +5.0 | +6.0 | +7.0 |
| **code** | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| **value (dB)** | +8.0 | +9.0 | +10.0 | +11.0 | +12.0 | +13.0 | +14.0 | -1 |
| **code** | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| **value (dB)** | -2 | -3 | -4 | -5 | -6 | -7 | -8 | -9 |
| **code** | 24 | 25 | 26 | | | | | |
| **value (dB)** | -10 | idle | +0.6 | | | | | |

## Configure DPNSS1 with IP expansion cabinets

When configuring a PRI2 card sot number for DPNSS1, the response to the DDCS prompt in LD 17 is: 1-9 (main cabinet), 11-19 (IP expansion cabinet1), 21-29 (IP expansion cabinet 2), 31-39 (IP expansion cabinet 3), 41-49 (IP expansion cabinet 4.)

## Configure ISDN BRI trunking with IP expansion cabinets

When configuring the MISP card slot number for ISDN BRI trunking in LD 27, the response to the LOOP prompt is: 1-9 (main cabinet), 11-19 (IP expansion cabinet1), 21-29 (IP expansion cabinet 2), 31-39 (IP expansion cabinet 3), 41-49 (IP expansion cabinet 4.)

When configuring the DSL for ISDN BRI trunking in LD 27, the response to the MISP prompt is: 1-9 (main cabinet), 11-19 (IP expansion cabinet1), 21-29 (IP expansion cabinet 2), 31-39 (IP expansion cabinet 3), 41-49 (IP expansion cabinet 4.)

# DTI Maintenance

## Contents

This section contains information on the following topics:

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Grade-of-Service messages . . . . . 68
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## Overview

From a maintenance perspective, Option 11C DTI operation consists of the following major aspects:

- hardware and software states
- near-end and far-end status
- link and/or span integrity
- clocking status
- frame alignment

Option 11C DTI operation is monitored and reported on through maintenance messages, out-of-service alarms, and circuit card faceplate LEDs.

Option 11C maintenance provides several tools, either manual or automatic, for maintaining effective DTI operation. These tools are service change and maintenance commands that are accessible through the software overlays and resident diagnostic routines.

# Replace the NTAK10 2.0 Mb DTI card

To replace a DTI circuit pack, follow the procedure below:

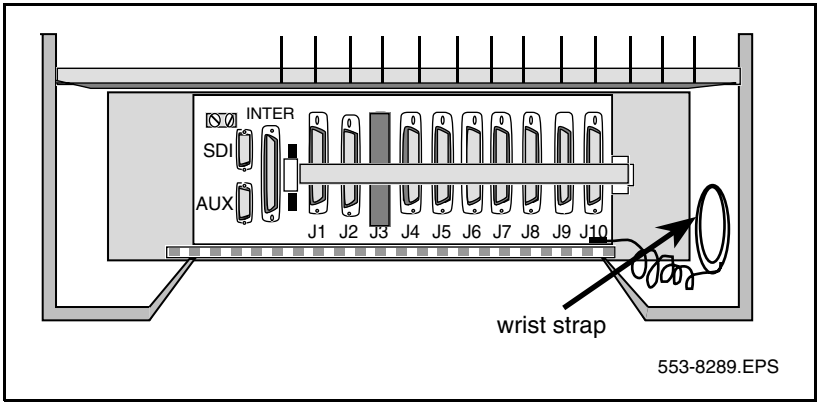
**1** Software disable the NTAK10 2.0 Mb DTI card(s) using LD 60 (command DISL N, where N is the 2.0 Mb DTI card number).

**2** Software disable the clock controller using LD 60 (DIS CC 0).

**3** Hold the NTAK10 by the lock latches, unlock the latches and slide the card out of the cabinet. Once out of the slot you may remove any of the daughterboards.

To avoid damage to the circuit cards from electrostatic discharge, wear the wrist strap connected to the inside of your Option 11C cabinet whenever handling the circuit cards. Figure 7 shows the location of the wrist strap in relation to the cabinet.

**Figure 7**
**Wrist strap connection to the Option 11C cabinet**




**4** Slide the new card into the cabinet and lock the latches.

5 Software enable all NTAK10 2.0 Mb DTI cards using LD 60 (command ENLL N, where N is the 2.0 Mb DTI card number).

6 Software enable the clock controller using LD 60 (ENL CC 0).

7 Enable clock tracking on primary digital loop by issuing the following command TRCK PCK.

# Monitor Option 11C DTI operation

## Maintenance messages

The 2.0 Mb DTI status and error conditions are reported in the following types of messages, as shown in Table . Additional information on DTI messages can be found in the *X11 System Messages Guide* (553-3001-411).

**Table 20**
**Maintenance messages**

| Message | Meaning |
|---|---|
| DTA | Digital Trunk Alarms (Resident Monitor) |
| DTI | Digital Trunk Interface |

## 2.0 Mb DTI Error messages

The Digital Trunk Interface diagnostic program (LD 60) is used to maintain the NTAK10 2.0 Mb DTI Interface Card.

Comprehensive lists of the self-test failure codes for the NTAK10 2.0 Mb DTI follow the self-test description, later in this chapter.

## Grade-of-Service messages

Grade-of-Service messages (DTA XXX) provide near and far end switch status. A summary of these status messages is given in Table 21:

**Table 21**
**Grade-of-Service messages**

| Status | 2.0 Mb DTI Capability |
|---|---|
| Acceptable | Both incoming and outgoing calls allowed |
| Maintenance | Both incoming and outgoing calls allowed |
| No new data calls | No new outgoing data calls |
| No new calls | No new outgoing data or voice calls |
| Out of Service | 2.0 Mb DTI is disabled |

## 2.0 Mb DTI Alarms

There are two groups of alarm indicators monitored by the 2.0 Mb DTI. Within these two alarm groups there are several individual alarm types.

**Group 1** alarms are event driven and include indicators that decrement a counter whenever an error is detected. Grade-of-service is changed based on how quickly the threshold of the counter is exceeded. The threshold count is determined in LD 73 and downloaded to the 2.0 Mb DTI. Group 1 alarms are:

**1** Bipolar Violations (BPV)—Near End Alarm

**2** Slips (SLP)—Near End Alarm

**3** Frame Alignment Problems (FAP)—Near End Alarm

**4** Cyclic Redundancy Check (CRC-4)—Near End Alarm

**Group II** alarm indicators may be either continuous or spurious. Grade-of-service is changed based on the duration of the alarm within a defined period of time. A minimum persistence time is defined in LD 73 and downloaded to the 2.0 Mb DTI.

Group II alarm types are listed from high to low priority. A Group II alarm type may not be reported when a greater type is detected.

**1** Alarm Indication Signal (AIS)—Far End Alarm

**2** Loss of Frame Alignment Signal (LFAS)—Near End Alarm

**3** Loss of Multiframe Alignment Signal (LMAS)—Near End Alarm

**4** Loss of CRC-4 Multiframe Alignment Signal (CFAS)—Near End Alarm

**5** Remote Alarm Indication (RAI, B3)—Far End Alarm

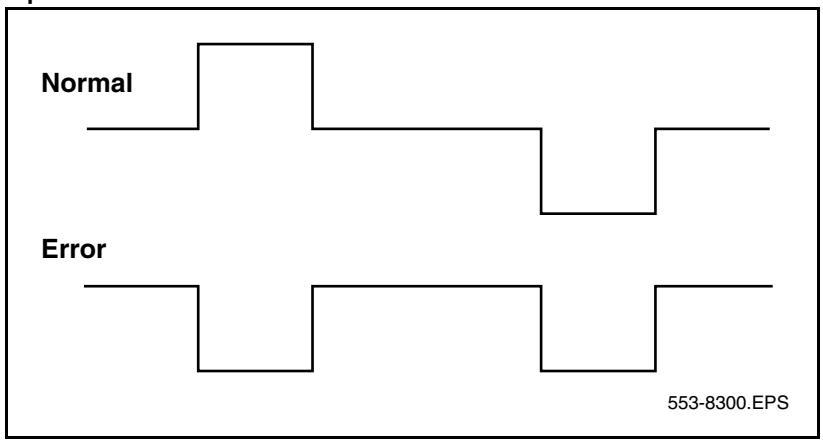
**6** Remote Yellow Alarm (B6)—Far End Alarm

**7** Alarm Indication Signal, 64 Kilobit (AIS 64)—Far End Alarm

### Group 1

**Bipolar violation (BPV)** In a bipolar pulse stream, pulses alternate in polarity. A bipolar violation has occurred if, after transmission, two pulses of the same polarity are received in succession (this could be caused by an electrical disturbance such as noise).

**Figure 8**
**Bipolar violations**




**Cyclic Redundancy Check (CRC-4)** When the 2.0 Mb DTI card is running in CRC-4 mode, the CRC-4 word contains a checksum of all data in the multiframe. The receiving side uses the checksum to verify the data.

The primary difference between BPV and CRC is that bipolar violation tracking indicates errors in the local span, while CRC indicates errors on an end-to-end span. For example, on a satellite link, BPV only detects errors in the span between the Meridian 1 and the satellite connection. Since CRC traverses the entire span, it indicates an end-to-end bit error rate.

**Slip (SLP)** Digital signals must have accurate clock synchronization for data to be interleaved into or extracted from the appropriate timeslot during multiplexing and demultiplexing operations. A Frame slip is defined as the repetition of, or deletion of 256 bits (one frame) due to a discrepancy in the read and write rates at the buffer (clocks aren't operating at EXACTLY the same speed)

When data bits are written into (added to) a buffer at a slightly *higher* rate than that at which they are being read (emptied), sooner or later the buffer overflows This is a slip-frame deletion.

In the opposite situation, when data bits are written (added) into a buffer at slightly *lower* rate than that at which they are being read (emptied), eventually the buffer runs dry or underflows. This is also a slip-frame repetition.

All of the degradations shown in Table 22 can be controlled or avoided by proper clock (network) synchronization.

**Table 22**
**Performance Impact of one Slip**

| Service | Potential Impact |
|---|---|
| Encrypted Text | Encryption key must be resent. |
| Video | Freeze frame for several seconds. Loud pop on audio. |
| Digital Data | Deletion or repetition of Data. Possible Misframe. |
| Facsimile | Deletion of 4-8 scan lines. Drop Call. |
| Voice Band Data | Transmission Errors for 0.01 to 2 s. Drop Call. |
| Voice | Possible Click |

Clock synchronization can be either tracking, on the primary or secondary reference clock, or free run (non-tracking). In LD 73 (prompts PREF and SREF), the 2.0 Mb DTI which supports the active clock controller is defined as the primary clock reference. Another 2.0 Mb DTI may be defined as the secondary clock reference. The clock controller synchronizes from the primary or secondary's incoming pulse stream. The clock controller in turn supplies clocking to all the other 2.0 Mb DTI cards.

2.0 Mb DTI hardware detects frame slips in tracking and free run modes. For tracking mode, running the midnight routines prints the number of overflows and clears the counter. For free run mode, running the midnight routines prints the number of slips and clears the counters.

**Frame Alignment Problem (FAP)** A Frame Alignment Problem is counted when a bit error occurs within the framing pattern.

### Group 2

**Loss of Frame Alignment Signal (LFAS)** A Loss of Frame Alignment condition can be defined as: frame alignment is lost on three consecutive frame alignment errors. This condition may occur as a result of the far end of the E1 span going completely out of service.(due to a power interruption, for example) or any other reason resulting in losing the incoming pulse stream. The B3 alarm is sent to the far end after the persistence time expires.

**Loss of frame alignment thresholds** 2.0 Mb DTI hardware detects out of frame conditions. Running the midnight routines prints the number of occurrences when frame alignment was lost and clears the counters.

**Alarm Indication Signal (AIS)** AIS is defined as receiving all ones without framing. The detection algorithm for AIS is two or less zeros per two frames. This allows detection of AIS in the presence of a 10E-3 error rate, without mistaking framed all 1s for AIS.

When the AIS is detected, the prompt maintenance alarm indication associated with LFAS and excessive bit error rates should be inhibited. B3 alarm is sent to the far end after persistence time expires

**Alarm Indication Signal 64 Kilobit (AIS64)** There are also specific AIS requirements for CNET (France). The first requirement relates to the transmission of AIS in TS16. In that case, all 1 should be transmitted in the event abcd signaling cannot be supported.

With respect to the reception of AIS in TS16, AIS 64 Kbits must be detected when multiframe alignment has been lost and the binary content of TS16 is 95 percent 1, counting on 256 or 512 bits.

When AIS in TS16 is detected, then bit 6 of outgoing TS16 frame 0 should be set. When the fault disappears, it should then be cleared. Setting and clearing bit 6 of TRS 16 frame 0 must follow changes in status of the fault by less than 100 msec.

Other requirements when AIS 64 Kbit is detected include setting an LED, printing a TTY message and the updating of present status and history files. When a fault is detected, further changes in other error types should continue to be reported.

**Loss of Multiframe Alignment Signal (LMAS)** This condition is sometimes called a multiframe yellow alarm. An LMAS occurs when two consecutive multiframes contain errors in their Multiframe Alignment Signal, or when all TS16 bits are zero for at least one multiframe.

B6 alarm is sent to the far end after persistence time expires. If the option is enables, B3 alarm is also sent.

**Loss of CRC-4 Multiframe Alignment Signal** This condition is declared when the CRC-4 multiframe search fails to recognize two valid multiframe alignment words within 8 msec. This category is only relevant however, when CRC-4 option is selected.

B6 alarm is sent to the far end after persistence time expires. If the option is enabled, B3 alarm is also sent.

**Remote Alarm Indication (RAI)** Bit 3 of TS0 in non-FAS frames is set to "1". This alarm is sometimes called a yellow alarm. The far end is receiving AIS.

**Remote Yellow Alarm (B6)** Bit 6 of TS16 in Frame 0 is "1". This alarm occurs when the far end has detected a loss of MFA.

### Alarm threshold recommendations for digital trunks

If a digital trunk is present in an IP Expansion cabinet, link outages due to data network performance degradation between main cabinet and expansion cabinet will cause alarms on the far end of the digital trunk. If link outages are frequent, alarm thresholds on the far end may need to be increased to prevent the trunk from being placed in a state requiring manual intervention to recover.

## NTAK10 Faceplate LEDS

The NTAK10 2.0 Mb DTI circuit card has a total of six LEDs on its face. Five of the LEDs are directly associated with the operation of the NTAK10 2.0 Mb DTI circuit card. The remaining LED is associated with the on-board clock controller. Table 23 shows the LEDs found on the NTAK10 2.0 Mb DTI circuit card and the meaning of each:

**Table 23**
**NTAK10 Faceplate LEDS (Part 1 of 2)**

| LED | State | Definition |
|---|---|---|
| DIS | On (Red) | The NTAK10 2.0 Mb DTI circuit card is disabled |
| | Off | The NTAK10 2.0 Mb DTI is not in a disabled state |
| OOS | On (Yellow) | The NTAK10 2.0 Mb DTI circuit card is in an out of service state. |
| | Off | The NTAK10 is not in an out of service state. |
| NEA | On (Yellow) | A near end alarm state has been detected |
| | Off | No near end alarm |
| FEA | On (Yellow) | A far end alarm state has been detected |
| | Off | No far end alarm |
| LBK | On (Yellow) | NTAK10 2.0 Mb DTI is in loop-back mode |

**Table 23**
**NTAK10 Faceplate LEDS (Part 2 of 2)**

| | | |
|---|---|---|
| | Off | NTAK10 2.0 Mb DTI is not in loop-back mode |
| CC | On (Red) | The clock controller is switched on and disabled |
| | On (Green) | The clock controller is switched on and is either locked to a reference or is in free run mode |
| | Flashing (Green) | The clock controller is switched on and locking onto the primary reference |
| | Off | The clock controller is switched off |

# Option 11C DTI maintenance tools

The tables below provide DTI and clock controller maintenance commands.

**WARNING**

You must disable the clock controller before unseating circuit cards, otherwise the system will initialize and momentarily interrupt call processing.

## DTI commands

Below is a quick reference list of important 2.0 Mb DTI commands in LD 60.

**LD 60** – DTI commands.

| Command | Action |
|---|---|
| DLBK L | Disable “loopback mode” for 2.0 Mb DTI |
| RLBK L | Enable “loopback mode” for 2.0 Mb DTI |
| DISI L | Disable 2.0 Mb DTI when idle |
| DISL L | Force disable 2.0 Mb DTI |

| | |
|---|---|
| ENLL L | Enable 2.0 Mb DTI |
| LCNT (L) | List alarm counters |
| RCNT (L) | Reset alarm counters |
| SLFT (L) | Do 2.0 Mb DTI self-test |
| STAT (L) | List 2.0 Mb DTI status |

## Clock Controller commands

Below is a quick reference list of clock controller commands in LD 60.

| **Command** | **Action** |
|---|---|
| DIS CC 0 | Disable clock controller N |
| ENL CC 0 | Enable clock controller N |
| SSCK 0 | Status of clock controller N |
| TRCK XXX | Set clock controller tracking. XXX can be: |
| PCK | Track primary clock reference source |
| SCLK | Track secondary clock reference source |
| FRUN | Free run mode |

## 2.0 Mb DTI tests

### Self test/Local loopback

The NTAK10 self-tests when requested in LD 60. This procedure checks the sanity of the on board processors, operation of memory and peripheral hardware as well as per-channel and per-loop loopback.

Before this test is run, the loop must be disabled as follows:

**1** Disable the NTAK10 using LD 60:

**LD 60**

**DISL L CH**

**2** Run the self-test using LD 60:

**LD 60**

**SLFT L** (for the entire loop)

**SLFT L CH** (for a specific channel)

Local loopback may also be performed on a per-channel basis without having to disable the entire loop. In this case, only the tested channel must be disabled. The procedure for this test is as follows:

**1** Disable the 2.0 Mb DTI channel using LD 60:

**LD 60**

**DISL L CH**

**2** Run the self-test using LD 60:

**LD 60**

**SLFT L CH** (for a specific channel

For self testing individual channels, follow the same procedure as above, but use the following commands:

**DSCH C CH**

**SLFT C CH** (specific channel)

**Table 24**
**Self-test failure codes for NTAK10 2.0 Mb DTI (Part 1 of 5)**

| | |
|---|---|
| DTI009 loop ch | DTI/PRI loop or channel failed hardware self test. For DTI009 L M E, the output data is<br>L = loop<br>M = N for NI microprocessor<br>M = C for CI microprocessor<br>E = error code for debug purposes. |
| DTI009C ch | DTI Card C or channel ch of Card C failed hardware self-test. |
| | **Error codes for NI microprocessor (M=N):** |
| | 00 = NI self test has finished.<br>01 = Undefined messout received<br>02 = Problem with group 2 error handling (invalid level)<br>03 = NI to CI FIFO full (128 messages lost)<br>04 = CI-1 Micro failed to initialize on power-up<br>05 = NI group 1 error handling - undefined condition found<br>06 = Bad MESSOUT number 6 encountered.<br>07 = NI Messout queue is full.<br>08 = NI Messin queue full.<br>09 = NI priority Messin queue is full.<br>10 = Bad MESSOUT number 10 encountered.<br>11 = TN = 0 read from regular queue.<br>12 = TN = 0 read from priority queue.<br>14 = Bad TN associated with MESSOUT number 14<br>15 = Bad TN associated with MESSOUT number 15 |

**Table 24**
**Self-test failure codes for NTAK10 2.0 Mb DTI (Part 2 of 5)**

| | |
|---|---|
| | 50 = External RAM in range 880h-8EFH failed (MESSIN queue)<br><br>51 = Internal RAM test failed.<br><br>52 = Pad RAM test failed.<br><br>53 = External RAM test failed.<br><br>54 = 8253 or DALLAS timer/counter test failed.<br><br>55 = Slip counter test failed.<br><br>56 = Loopback of TS16 frame 0 failed.<br><br>57 = Loopback of non fas TSO failed.<br><br>58 = Echo test to CI-1 micro failed.<br><br>60 = A07 device failed<br><br>61 = Motorola DUART failed<br><br>62 = Multiframe loopback test failed<br><br>255 = Loss of NI FIFO synchronization (Stop byte = 0 not found). |
| | **DTI009 error codes for CI microprocessor (M=C):** |
| | 03 = A complete message was not received from NI micro<br><br>128 = Message received by CI-1 through FIFO requested an undefined task.<br><br>129 = Request for a timed two-state pulse was received, with the TN of TS 0 or 16<br><br>130 = An attempt was made to set the flag to invoke the pulse timer for TS 0.<br><br>131 = A request for a task defined under Messout 30 has been received with the TN of TS 0. |

**Table 24**
**Self-test failure codes for NTAK10 2.0 Mb DTI (Part 3 of 5)**

| | |
|---|---|
| | 132 = Attempt was made to enable outpulsing TS 0 or TS16.<br><br>133 = A Messout 31 has been received for TS 0 or TS 16 with the pulse hold time not = 0.<br><br>134 = An attempt has been made to set the bit to invoke the pulse timer for TS 0 or TS 16.<br><br>135 = A request for outpulsing was received, but outpulsing data was not downloaded.<br><br>137 = A request for PPM counting was received, but the was not downloaded.<br><br>138 = A Messout 30 was received requesting a task to be performed for DTI TS 16 which is not allowed. |
| **DTI009C ch** | DTI009 error codes for CI microprocessor (M=C): |
| | 139 = The 8031 on CHIP RAM failed self test.<br><br>140 = The TS 16 signaling RAM and/or the TS 16 pick up buffer failed self test.<br><br>141 = The CI-1 micro external RAM failed self test.<br><br>142 = Attempt was made to set/clear the flag used to invoke PPM pulse timing for DTI timeslot 0 or 16.<br><br>143 = CI-2 micro responded to echo request message but response was in error.<br><br>144 = CI-2 micro failed to respond to request echo message.<br><br>145 = The request for self test received did not have the TN of TS 0<br><br>146 = The TN of MESSOUT 26 received was not that or TS 0.<br><br>147 = The TN of MESSOUT 28 received was not that of TS 0. |

**Table 24**
**Self-test failure codes for NTAK10 2.0 Mb DTI (Part 4 of 5)**

| | |
|---|---|
| | 148 = The TN of MESSOUT 29 received was not that of TS 0.<br><br>149 = Upon enabling the DTI card, the CI-1 was unable to write Frame 0, TS 16 with '0B'.<br><br>150 = MESSOUT 26 was received with the PPM counting bit (abcd) all equal to zero.<br><br>151 = MESSOUT 28 was received with the outpulsing bit (abcd) equal to zero.<br><br>152 = CI-2 failed to respond to the CI-1 watch dog message.<br><br>153 = The CI-2 failed to respond to five consecutive watchdog<br>messages and is assumed to be out of service.<br><br>154 = Messout received requesting the lower nibble of MFAS<br>pattern to be written with something other than '0000'.<br><br>155 = MESSOUT received requesting '0000' to be written into an 'abcd' state.<br><br>156 = MESSOUT received with a TN outside the range shelf 0, card 8-1<br>unit 3-0. |
| **DTI009C ch** | **DTI009 error codes for CI microprocessor (M=C):** |
| | 157 = CI-1, NI FIFO overflowed, and has been cleared. 128 message were lost.<br><br>255 = TS16-DS30X FIFO overflowed, and has been cleared. 128 messages were lost.<br><br>147 = The TN of MESSOUT 28 received was not that of TS 0.<br><br>148 = The TN of MESSOUT 29 received was not that of TS 0. |

**Table 24**
**Self-test failure codes for NTAK10 2.0 Mb DTI (Part 5 of 5)**

| | |
|---|---|
| | 149 = Upon enabling the DTI card, the CI-1 was unable to write Frame 0, TS 16 with '0B'.<br><br>150 = MESSOUT 26 was received with the PPM counting bit (abcd) all equal to zero.<br><br>151 = MESSOUT 28 was received with the outpulsing bit (abcd) equal to zero.<br><br>152 = CI-2 failed to respond to the CI-1 watch dog message.<br><br>153 = The CI-2 failed to respond to five consecutive watchdog messages and is assumed to be out of service.<br><br>154 = Messout received requesting the lower nibble of MFAS pattern to be written with something other than '0000'.<br><br>155 = MESSOUT received requesting '0000' to be written into an 'abcd' state.<br><br>156 = MESSOUT received with a TN outside the range shelf 0, card 8-1, unit 3-0. |
| **DTI009C ch** | **DTI009 error codes for CI microprocessor (M=C):** |
| | 157 = CI-1, NI FIFO overflowed, and has been cleared. 128 message were lost.<br><br>255 = TS16-DS30X FIFO overflowed, and has been cleared. 128 messages were lost. |

### Near End Trunk loopback test

The near end trunk loopback test checks the integrity of the 2.0 Mb link from the Option 11C to the far end. Either a per-loop or per channel test may be run, with the far end device placed in the respective mode of remote loopback. Refer to Figure 9 on page 82.

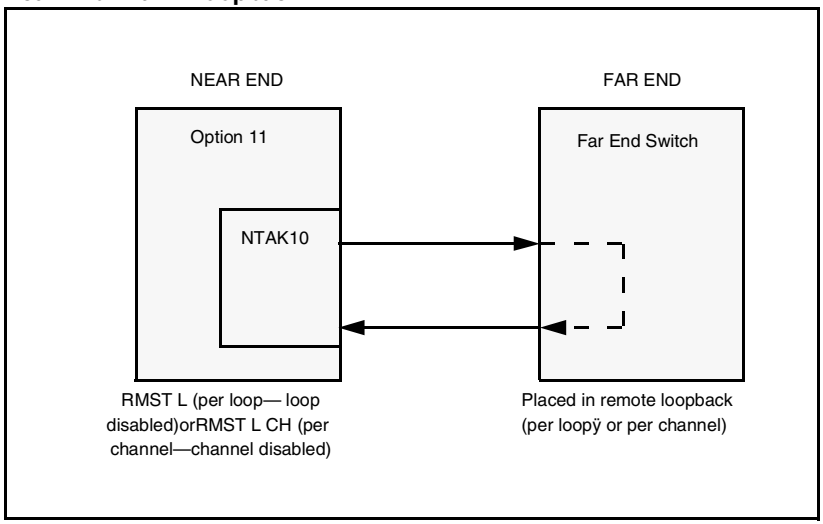
The procedure for a near-end per-loop loopback test is as follows:

| Procedure | Overlay | Command |
|---|---|---|
| Disable the 2.0 Mb DTI card | LD 60 | DISL L |
| Run the loopback test | LD 60 | RMST L |

The procedure for a near-end per-channel loopback test is as follows:

| Procedure | Overlay | Command |
|---|---|---|
| Disable the 2.0 Mb DTI channel | LD 60 | DSCH L CH |
| Run the loopback test | LD 60 | RMST L CH |

**Figure 9**
**Near End Trunk Loopback**


NEAR END
FAR END
Option 11
Far End Switch
NTAK10
RMST L (per loop— loop disabled)orRMST L CH (per channel—channel disabled)
Placed in remote loopback (per loopÿ or per channel)

### Far End Trunk loopback test

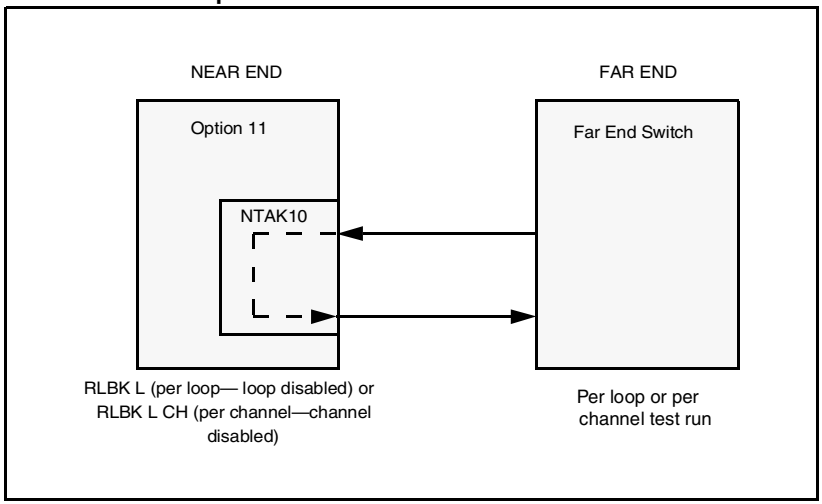
The far end trunk loopback test checks the integrity of the 2.0 Mb link from the far end to the carrier interface of the 2.0 Mb DTI (it does not test the 2.0 Mb DTI card). Either a per-loop or per-channel test may be run, with the near end device placed in the respective mode of remote loopback. Refer to Figure 10.

The procedures for **per-loop loopback tests** follow:

| Procedure: near-end | Overlay | Command |
|---|---|---|
| Disable the 2.0 Mb DTI card | LD 60 | DISL L |
| Place the 2.0 Mb DTI card in remote per-loop loopback | LD 60 | RLBK L |

| Procedure: far-end | Overlay | Command |
|---|---|---|
| Disable the 2.0 Mb DTI channel | LD 60 | DSCH L CH |
| Place the 2.0 Mb DTI channel in remote loopback | LD 60 | RLBK L CH |

**Figure 10**
**Far End Trunk Loopback**


NEAR END
FAR END
Option 11
Far End Switch
NTAK10
RLBK L (per loop— loop disabled) or RLBK L CH (per channel—channel disabled)
Per loop or per channel test run

# PRI Maintenance

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# Reference list

The following are the references in this section:

- *X11 Maintenance* (553-3001-511)

# Overview

This chapter provides an overview of the maintenance tools available for 2.0 Mb PRI or ISL features:

- commands used to maintain PRI, DDCH, DCHI and clock controller hardware
- tests for 2.0 Mb PRI operation
- error detection for 2.0 Mb PRI, including the various thresholds found in the 2.0 Mb PRI loop timers in LD 73.

# Enable the 2.0 Mb PRI after installation

To enable an NTAK79 or NTBK50 PRI circuit pack, follow one of the appropriate procedures which follow.

## Enable the NTAK79 PRI

1. Software enable all 2.0 Mb PRI cards using LD 60 (command ENLL N). The DCHI will enable automatically from the enable PRI command.
2. Software enable the clock controller using LD 60 (command ENL CC 0).
3. Enable clock tracking on primary digital loop by issuing the following command: TRCK PCK.

   Within about 30 seconds the D-channel layer 3 should be established.
4. You can request the current status of the D-channel by issuing the command STAT DCH. The system should respond DCH N EST in LD 96 (meaning that the D-channel is established and operational).

### Enable the NTBK50 PRI

1. If using the NTBK51 DDCH daughterboard, enable the DDCH in LD 96 by issuing the command ENL MSDL X.
2. Software enable all 2.0 Mb PRI cards using LD 60 (command ENLL N). The DCHI will enable automatically from the enable PRI command.
3. Software enable the clock controller using LD 60 (command ENL CC 0).
4. Enable clock tracking on primary digital loop by issuing the following command: TRCK PCK.

   Within about 30 seconds the D-channel layer 3 should be established.
5. You can request the current status of the D-channel by issuing the command STAT DCH. The system should respond DCH N EST in LD 96 (meaning that the D-channel is established and operational).

## Disable the 2.0 Mb PRI before removal

To disable a PRI circuit pack, follow the appropriate procedure below.

### Disable the NTAK79 PRI

1. Software disable the DCHI using LD 96, command DIS DCH N, where N is the D-channel device number.
2. Software disable the clock controller using LD 60 (DIS CC 0).
3. Software disable the PRI card using LD 60 (command DISL N, where N is the PRI card number).

### Disable the NTBK50 PRI

1. Software disable the DCHI using LD 96, command DIS DCH N, where N is the D-channel device number.
2. If using the NTBK51 DDCH daughterboard, enter the DIS MSDL N command in LD 96.
3. Software disable the clock controller using LD 60 (DIS CC 0).
4. Software disable the PRI card using LD 60 (command DISL N, where N is the PRI card number).

# Monitor Option 11C PRI operation

## Maintenance messages

Service messages report on near and far end switch status. Both service and service acknowledge messages are supported on PRI B-channels and ISL channels. These messages are used for backup D-channel and D-channel sanity polling. The status may be in-service and out-of-service.

Service and service acknowledge messages for B-channels and ISL channels are supported between:

- Meridian 1 to Meridian 1: ISL and PRI
- Meridian 1 to CO: PRI only

The status of these messages is reported by the service and service acknowledge messages for B-channels and ISL channels:

- in-service
- maintenance
- out-of-service

Near end and far end subcategories are defined for each maintenance status. See Table  for possible combinations of near end and far end status, and the channel capability for each status. When the status of the near end and far end does not match, the more severe maintenance status takes effect over the less severe maintenance status.

**Table 25**
**Maintenance message status**

| Near end status | Far end status | B channel capability |
|---|---|---|
| In-service | In-service | both incoming and outgoing calls allowed |
| In-service | Maintenance | only incoming calls allowed |
| In-service | Out-of-service | not allowed to use |
| Maintenance | N/A | not allowed to use |
| Out-of-service | N/A | not allowed to use |

### Service message function

Service messages are used to monitor the following:

- D-channel establishment
- D-channel sanity polling
- B-channel or ISL status change
- Channel status audit.

### D-channel establishment

When the D-channel establishes, the B-channel status is supported by sending service messages for each B-channel controlled by a D-channel. This allows the far end to synchronize its channel states. These services messages are sent when the D-channel is brought up automatically by the system or manually by using LD 96.

### D-channel sanity polling

If a D-channel has been idle for 30 seconds, a service message is sent to poll the sanity of the link. The service message is sent regardless of whether the near end is configured as master or slave.

### B-channel status change

Whenever there is a status change for a B-channel or an ISL channel, the new status is reported to the far end in a service message. Status change can occur through service change or maintenance operations, such as the addition or deletion of a channel in LD 14, or disabling of the associated loop, shelf, card or unit in LD 30, LD 32, LD 36, LD 41 or LD 60.

### Channel status audit

LD 30 is enhanced to allow channel status audit to be initiated. The channels associated with each D-channel are examined and their status is reported to the far end by service messages.

### Service message commands

You activate the service messages in LD 96 on a per D-channel basis. The commands are:

- ENL SERV N: turns on the support of service and service acknowledge messages for DCH link N. The command should only be executed when the specified D-channel is in the disabled state.

- DIS SERV N: turns off the support of service and service acknowledge messages for DCH link N.
- STAT SERV (N): displays the current service and service acknowledge message SERV setting for individual DDCH N or for DCHIs.

Two new statuses are added for maintenance messages, FE MbSY = Far end maintenance and FE DSBL = Far end disabled.

## 2.0 Mb PRI error detection

The Primary Rate Interface categorizes errors and alarm conditions into two main groups, Group I and Group 2 errors.

### Group I Errors

These are real-time calculated error-rate thresholds. Group I errors can include:

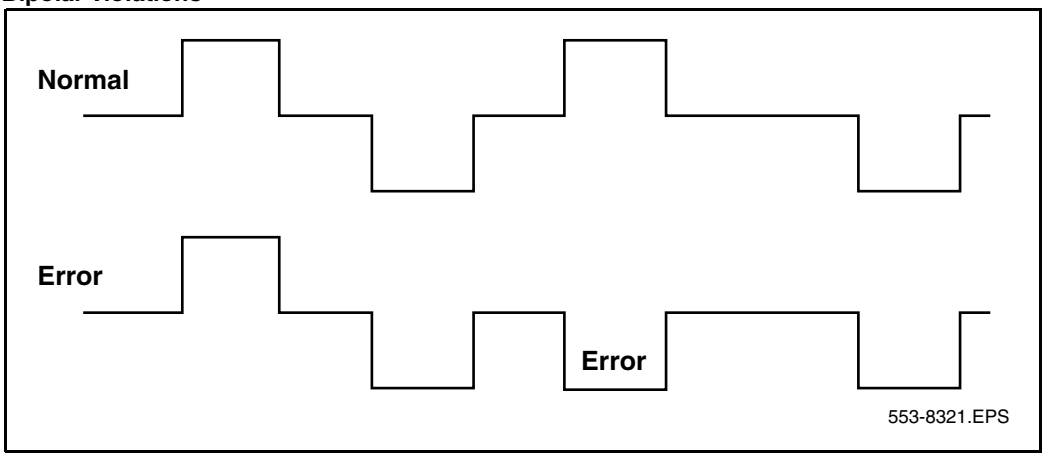
- Bipolar Violations (BPV)
- Frame Bit Errors (FBER)
- CRC-4 Word Errors (CRC)
- Controlled Frame Slips

### Bipolar Violations

In a alternate mark inversion (AMI) bipolar pulse stream, pulses alternate in polarity. A bipolar violation has occurred when two pulses of the same polarity are received in succession, as shown in Figure 11. This might be caused by an electrical disturbance such as noise, a low signal level or a faulty repeater Bipolar violations give a good indication of the integrity of the local span from the Meridian 1 to the first repeater.

The PRI card, following the CEPT PCM-30, uses a zero code suppression technique known as HDB3 which introduces intentional bipolar violations onto the carrier. This is accounted for by the receiver and disregarded as bipolar violation errors.

**Figure 11**
**Bipolar violations**




### Frame Bit Errors

The NTAK79/NTBK50 PRI CEPT PCM-30 stream is structured into a frame of 32 8-bit timeslots. To maintain alignment of this frame structure, alternate timeslot zeros have a specific frame alignment pattern (X0011011).

A frame bit error is acknowledged when any of the bits in the received pattern are in error. This error rate provides an indication of the integrity of the complete end-to-end span.

### CRC-4 Word Errors

When operating in the CRC-4 multiframe format (CRC), frames are bundled into groups of 16. This format includes a specific multiframe alignment pattern in bit 0 of every even frame's timeslot 0 (001011XX).

Each odd frame timeslot 0 includes a CRC-4 cyclic redundancy checksum of the previous 8 frames (sub-multiframe). This transmitted checksum is compared against a calculated checksum at the receiver. If the two checksums do not match, a CRC-4 Word error is indicated.

Group I error rates are processed on the PRI card based on software downloadable parameters N1 and N2 (for each BPV, CRC and FBER). The values for N1 are scaled on the card as follows:

- BPV = N1•16
- CRC = N1• 4
- FBER = N1• 1

N2 values are not scaled. These parameters may be established in LD 73 on a per card basis, or they can be left at their default values.

Parameters N1 and N2 provide for the following error rate thresholds reported to the system:

**Severely Errored Second**: when the number of occurrences of the error exceeds the value of N1 in the previous second. This error is reported and counted (LCNT), but no action is taken by the system.

**Unavailable Condition**: this is reported when 10 severely errored seconds are received in 10 consecutive seconds. This is equivalent to an error rate worse than $10^{-3}$ with the default value. When this condition is reached, the 2.0 Mb PRI is put into an out-of-service condition until the Group I OOS guard timer expires and the error condition has ceased or improved.

**No New Call Condition**: when the number of occurrences of the error exceeds the value of (10 x N2) in the previous minute. This corresponds to an error rate of $10^{-3}$ to $10^{-5}$ using the default N2 value. When this condition is reported, the system will record the error (LCNT) and place the PRI card into a no new call condition, with all idle channels set to MbSY. The card automatically returns to normal state when the condition improves after the Group I NNC guard timer expires.

**Maintenance Condition**: this condition implements when the number of occurrences of the error exceeds the value of N2 in the previous minute. This corresponds to an error rate between $10^{-5}$ and $10^{-6}$ based on the N2 default values. When this condition is reported, the system will record the error (LCNT) and place the 2.0 Mb PRI card into a maintenance alarm state. This state has no effect on call processing but simply alerts you of the line degradation. The card automatically returns to normal state when the condition improves after the Group I MAINT guard timer expires.

There is no error report for the error rates below $10^{-6}$ (10xN2), as such rates are considered satisfactory.

### Program Group I Thresholds

To set your LD 73 Group I thresholds, use the following commands.

**LD 73** – Program Group I Thresholds.

| Prompt | Response | Description |
|---|---|---|
| REQ | CHG | Request a Change |
| TYPE | PRI2 | Primary Rate Interface 2 |
| FEAT | LPTI | Loop Timer |
| ... | | |
| BPV | N1 N2 | Default: 128 122 |
| CRC | N1 N2 | Default: 201 97 |
| FBER | N1 N2 | Default: 28 1 |
| ... | | |
| OOS1 | 1 - 60 M | Default: 15 |
| NNC1 | 1 - 60 M | Default: 15 |
| MNT1 | 1 - 60 M | Default: 15 |

### Frame Slips

Digital signals must have accurate clock synchronization for data to be interleaved into or extracted from the appropriate timeslot during multiplexing and demultiplexing operations. A Frame Slip is defined (for 2.0 Mb links) as the repetition of, or deletion of the 256 data bits of a CEPT frame due to a sufficiently large discrepancy in the read and write rates at the buffer (clocks are not operating at exactly the same speed).

When data bits are written into (added to) a buffer at a slightly *higher* rate than that at which they are being read (emptied), sooner or later the buffer overflows This is a slip-frame deletion.

In the opposite situation, when data bits are written (added) into a buffer at slightly *lower* rate than that at which they are being read (emptied), eventually the buffer runs dry or underflows. This is also a slip-frame repetition.

A 2.0 Mb PRI contains a buffer large enough to contain 2 full frames (256 x 2 = 512 bits), and is normally kept half full (1 frame). See Table  for the impact of one slip on various types of data.

All of the degradations shown in Table  can be controlled or avoided by proper clock (network) synchronization.

**Table 26**
**Performance Impact of one Slip**

| Service | Potential Impact |
|---|---|
| Encrypted Text | Encryption key must be resent. |
| Video | Freeze frame for several seconds. Loud pop on audio. |
| Digital Data | Deletion or repetition of Data. Possible Misframe. |
| Facsimile | Deletion of 4-8 scan lines. Drop Call. |
| Voice Band Data | Transmission Errors for 0.01 to 2 s. Drop Call. |
| Voice | Possible Click |

Clock synchronization can be either tracking, on the primary or secondary reference clock, or free run (non-tracking). In LD 73 (prompts PREF and SREF), the 2.0 Mb PRI which supports the clock controller is defined as the primary clock reference. Another 2.0 Mb PRI (or DTI) may be defined as the secondary clock reference. The clock controller synchronizes from the primary's or secondary's references incoming bit stream. The clock controller in turn supplies a synchronized reference for the rest of the system, including all 2.0 Mb PRIs and DTIs.

The 2.0 Mb PRI card detects and reports frame slips (repetitions and deletions) to the Meridian 1. The count of slips is recorded (LCNT), printed out, and cleared at each midnight routine.

Frame slips have two alarm thresholds as defined in LD 73. They are as follows:

### *Slip - Out of Service Threshold*

When this threshold (variable count versus variable time) is reached, the PRI card is placed in an out-of-service state. The card automatically returns to a normal state if the slip rate improves after the Group I OOS guard timer expires.

### *Slip - Maintenance Threshold*

When this threshold is reached, the PRI card is placed in a maintenance state that has no impact on call processing. The maintenance state is simply an indication that a degraded condition exists. The card automatically returns to a normal state if the slip rate improves after the Group I MAINT guard timer expires.

### Define Slip Thresholds

To define your slip thresholds, use the following commands in LD 73. Times range from 1M to 24H (one 1 minute to 24 hours). Counts are 1 to 255.

**LD 73** – Define Slip Thresholds.

| Prompt | Response | Description |
|---|---|---|
| REQ | CHG | Request a Change |
| TYPE | PRI2 | Primary Rate Interface 2 |
| FEAT | LPTI | Loop Timer |
| | 5 24H | This entry establishes a maintenance threshold of 5 slips in 24 hours |
| SLIP | 20 1H | This entry establishes an OOS threshold of 20H [32] slips in 1 hour |

### Group 2 Errors

Group 2 errors are event-based alarms that can be separated into Red (local) and Yellow (far end) alarms.

### Yellow (Far End) Alarms

A Yellow alarm on the 2.0 Mb PRI card indicates that the card is receiving an alarm indication from the far end.

This type of alarm may be received in two ways:

- **Remote Alarm Indication** (RAI)—Bit 3 of non-FAS frame set

**or**

- **Alarm Indication Signal** (AIS)—All 1s on the carrier.

Since the 2.0 Mb PRI is receiving a Yellow alarm signal, that indicates that there is a carrier connection, but the far end is not ready. It is possible, however, that the carrier connection is one way only (2.0 Mb PRI receiving).

When the 2.0 Mb PRI receives a Yellow alarm signal, all channels are placed in a maintenance busy mode (MBSY). Group 2 Yellow alarms are recorded (LCNT) on each occurrence, but the card is not placed into an out-of-service state.

### Red (Local) Alarms

A Red alarm on the PRI card indicates that the card is having problems synchronizing with the incoming bit stream.

This type of alarm may be caused by the following:

- **Loss of Signal** (LOS)
- **Loss of Frame Alignment** (LFAS)
- **Loss of CRC-4 Multiframe Alignment** (LMAS)

When the 2.0 Mb PRI is in a Red alarm state, RAI is transmitted to the far end.

For both Group 2 Red and Yellow alarm states, action is taken after the condition has persisted for a downloaded persistence (PERS) threshold. The parameter is set in LD 73 in multiples of 2 msec, with 2 x 50 = 100 msec as the default.

For Group 2 Red alarm conditions, there are four definable time thresholds that can be set in LD 73 on a per-loop basis. The first parameter sets an aggregate time in multiples of 128 msec (default 20=2.5 sec). The next four parameters provide time thresholds for MAINT, NNDC, NNC, and OOS.

For example, if the total cumulative time that an error has been present reaches the aggregate time (2.5 sec default) in less than the time set in OOS, the card is put into an out-of-service state. If it took more than the preset time for the error condition to register, the card could be put into NNDC, NNC or MAINT states. The card remains in the alarm condition until the error has improved and after the Group 2 guard timers expire.

### Define Group 2 Error Thresholds

You are able to define Group 2 error thresholds in LD 73. Only the highest priority Group 2 alarm condition is active at a time. The order of priority (from highest to lowest) is: LOS, AIS, LFAS, LMAS, RAI.

**LD 73 –** Define Group 2 Error Thresholds

| Prompt | Response | Description | | | |
|---|---|---|---|---|---|
| REQ | NEW | New | | | |
| TYPE | DTI2 | 2.0 Mb/s DTI data block | | | |
| FEAT | LPTI | Loop Timer | | | |
| ... | | | | | |
| GP2 | 20 (Aggregate count default [20x128ms=2.5sec]) | 100s (Maintenance threshold) | 12s (NNDC threshold) | 12s (NNC threshold) | 4s (OOS threshold) |
| ... | | | | | |
| OOS2 | 1-(15)-255s | (Group 2 guard timer) | | | |
| NNC2 | 1-(15)-255s | (Group 2 guard timer) | | | |
| MNT2 | 1-(15)-255s | (Group 2 guard timer) | | | |
| PERS | 50 | (in multiples of 2ms) | | | |
| CLRS | 50 | (in multiples of 2ms) | | | |
| OOSC | 1-(5)-255 | (Out of service count limit) After this number is reached, the card does not auto-enable. | | | |

### Alarm threshold recommendations for digital trunks

If a digital trunk is present in an IP Expansion cabinet, link outages due to data network performance degradation between main cabinet and expansion cabinet will cause alarms on the far end of the digital trunk. If link outages are frequent, alarm thresholds on the far end may need to be increased to prevent the trunk from being placed in a state requiring manual intervention to recover.

## NTAK79 Faceplate LEDs

The NTAK79 circuit card has a total of seven faceplate LEDs. Five of the LEDs are directly associated with the operation of the Primary Rate interface (PRI). The remaining two LEDs are associated with the on-board Clock Controller and the on-board D-channel interface (DCHI). Refer to Table 27.

**Table 27**
**NTAK79 faceplate LEDs (Part 1 of 2)**

| LED | State | Definition |
|---|---|---|
| **OOS** | On (Red) | The NTAK79 2.0 Mb PRI circuit card is either disabled or out-of-service. |
| | Off | The NTAK79 2.0 Mb PRI is not in a disabled state. |
| **ACT** | On (Green) | The NTAK79 2.0 Mb PRI circuit card is in an active state. |
| | Off | The NTAK79 2.0 Mb PRI is in a disabled state. The OOS LED is red. |
| **RED** | On (Red) | A red alarm state has been detected. This represents a local alarm state of Loss of Carrier (LOS), Loss of Frame (LFAS) or Loss of CRC Multiframe (LMAS). |
| **Red** | Off | No red (local) alarm. |
| **YEL** | On (Yellow) | A yellow alarm state has been detected. This represents a remote alarm indication from the far end. The alarm may be either Alarm Indication (AIS) or Remote Alarm (RAI). |
| | Off | No yellow (remote) alarm. |

**Table 27**
**NTAK79 faceplate LEDs (Part 2 of 2)**

| | | |
|---|---|---|
| **LBK** | On (Green) | NTAK79 2.0 Mb PRI is in loop-back mode. |
| | Off | NTAK79 2.0 Mb PRI is not in loop-back mode |
| **CC** | On (Red) | The clock controller is switched on and software disabled |
| | On (Green) | The clock controller is enabled and is either locked to a reference or is in free run mode |
| | Flashing (Green) | The clock controller is enabled and is locking onto a reference. |
| | Off | The clock controller is switched off (by switch SW3). |
| **DCH** | On (Red) | DCHI is switched on and disabled |
| | On (Green) | DCHI is switched on and enabled, but not necessarily established. |
| | Off | DCHI is switched off (by switch SW1). |

## NTBK50 Faceplate LEDs

The NTBK50 circuit card has a total of seven faceplate LEDs. Five of the LEDs are directly associated with the operation of the Downloadable D-channel handler and D-channel interface. The remaining two LEDs are associated with the Clock Controller. Refer to Table .

**Table 28**
**NTBK50 faceplate LEDs**

| LED | State | Definition |
|---|---|---|
| **OOS** | On (Red) | The NTBK50 2.0 Mb PRI circuit card is either disabled or out-of-service. Also, the state of the card after power-up, completion of self test, and exiting remote loopback. |
| | Off | NTBK50 is not in a disabled state. |
| **ACT** | On (Green) | NTBK50 PRI circuit card is in an active state. |
| | Off | NTBK50 2.0 Mb PRI is in a disabled state. The OOS LED is red. |
| **RED** | On (Red) | A red alarm state has been detected. This represents a local alarm state of Loss of Carrier (LOS), Loss of Frame (LFAS) or Loss of CRC Multiframe (LMAS). |
| | Off | No red (local) alarm. |
| **YEL** | On (Yellow) | A yellow alarm state has been detected. This represents a remote alarm indication from the far end. The alarm may be either Alarm Indication (AIS) or Remote Alarm (RAI). |
| | Off | No yellow (remote) alarm. |
| **LBK** | On (Green) | NTBK50 2.0 Mb PRI is in loop-back mode. |
| | Off | NTBK50 2.0 Mb PRI is not in loop-back mode |

| LED | State | Definition |
|---|---|---|
| **CC** | On (Red) | The clock controller is software disabled |
| | On (Green) | The clock controller is enabled and is either locked to a reference or is in free run mode |
| | Flashing (Green) | NTAK20 is equipped and is attempting to lock (tracking mode) to a reference. If the LED flashes continuously over an extended period of time, check the CC STAT in LD 60. If the CC is tracking this may be an acceptable state. Check for slips and related clock controller error conditions. If none exist, then this state is acceptable, and the flashing is identifying jitter on the reference. |
| | Off | The clock controller is not equipped. |
| **DCH** | On (Red) | DCH is disabled. |
| | On (Green) | DCH is enabled, but not necessarily established. |
| | Off | DCH is not equipped. |

# Option 11C PRI maintenance tools

**Table 29**
**2.0 Mb PRI commands (LD 60)**

| Command | Action |
|---|---|
| DISI L | disable 2.0 Mb PRI when idle |
| DISL L | force disable PRI |
| ENLL L | enable PRI |
| LCNT (L) | list alarm counters |
| RCNT (L) | reset alarm counters and clear alarms |
| SLFT (L) | do 2.0 Mb PRI self-test (2.0 Mb PRI must be disabled first) |
| STAT (L) | list 2.0 Mb PRI status |
| RLBK L (C) | enable remote loopback |
| DLBK L (C) | disable remote loopback |
| RMST L (C) | Perform remote loopback |

PRI status and error conditions are reported in the following types of messages.

## DCHI commands

D-channel commands are found in LD 96. The following is a quick reference list of D-channel commands:

**Table 30**
**DCHI commands**

| Command | Action |
|---|---|
| DIS DCHI N | disable DCHI port N |
| ENL DCHI N | enable DCHI port N |
| EST DCH N | establish D-channel N |
| PLOG DCHI N | print D-channel statistics log N |
| RLS DCH N | release D-channel N |
| SDCH DCH N | release a D-channel and switch D-channels |
| RST DCH N | reset D-channel N |
| STAT DCH (N) | print D-channel status (link status) |
| TEST 100/101 | DCH tests |
| STAT SERV | Print the current service and service acknowledge message for DCHI N |
| ENL SERV N | Enable service messages for DCHI N |
| DIS SERV N | Disable service messages for DCHI N |

D-channel status and error conditions are reported as DCH messages. These messages can be found in the *X11 Maintenance* (553-3001-511).

## DDCH commands

Downloadable D-channel commands are found in LD 96. The following is a quick reference list of D-channel commands with minor modification:

**Table 31**
**DDCH commands**

| Command | Action |
|---|---|
| DIS MSDL X (ALL) | Disable DCHI card X |
| ENL MSDL X (FDL, ALL) | Enable DCHI card X, with or without Force Download |
| RST MSDL X | Reset MSDL card X |
| STAT MSDL X (X (full)) | Get MSDL status X, or a “FULL STATUS” |
| SLFT MSDL X | Execute a self test on MSDL card X |
| DIS LLB X | Disable local loop back on MSDL DCH X |
| DIS RLB X | Disable remote loop back on MSDL DCH X |
| DIS TEST X | Disable Test mode on MSDL DCH X |
| ENL LLB X | Enable local loop on MSDL DCH X |
| ENL RLB X | Enable remote loop on MSDL DCH X |
| ENL TEST X | Enable Test mode on MSDL DCH X |
| PCON DCH X | Print configuration parameters on MSDL DCH X |
| PMES DCH X | Print incoming layer 3 messages on MSDL DCH X |
| PTRF DCH X | Print traffic report on MSDL DCHX |
| TEST LLB X | Start local loop back test on MSDL DCH X |
| TEST RLB X | Start remote loop back test on MSDL DCH X |

***Note:*** “X” represents the D-channel device number

D-channel status and error conditions are reported as DCH messages. These messages can be found in the *X11 Maintenance* (553-3001-511).

## Clock Controller commands

Clock Controller commands are accessed using LD 60. The following is a quick reference list of clock controller commands:

**Table 32**
**Clock Controller commands**

| Command | Action |
|---|---|
| DIS CC X | Disable clock controller |
| ENL CC X | Enable clock controller |
| SSCK X | Status of clock controller |
| TRCK XXX N | Set clock controller tracking where XXX can be:<br>PCK—track primary clock reference source<br>SCLK—track secondary clock reference source<br>FRUN—free run mode |

## NTAK79/NTBK50 Power on self test

When power is applied to the NTAK79/NTBK50 2.0 Mb PRI circuit card, the card performs a power-on self-test. The self-tests verify the operation of most of the on-board hardware.

If all the self-tests pass, the upper 5 LEDs blink simultaneously three times. If any of the self-tests fail, the LEDs do not blink. Only the OOS LED illuminates. The corresponding error code is then printed on the TTY.

**Self-test error codes**
The following table lists the self test failure codes for the NTAK79/NTBK50 2.0 Mb PRI. These codes could be returned on card power-up in the form "DTA105 L X" (where X is the failure code), or during a self test procedure in LD 60 as "DTI009 L X" (where X is the error code).

Failure codes 1-14 are hardware failures on the NTAK79/NTBK50 card. Codes 15-16 may be due to carrier span problems or lack of loopback activation at the far end.

**Table 33**
**Self-Test error codes**

| Failure Code | Associated Error |
|---|---|
| 0 | Self test passed |
| 1 | Self test general failure |
| 2 | LCAs failed to program correctly |
| 3 | 8031 code checksum failure |
| 4 | 8031 internal RAM failure |
| 5 | 8031 external RAM failure |
| 6 | PAD RAM failure |
| 7 | AO7 signaling interface failure |
| 8 | UART (card LAN) failure |
| 9 | CEPT transceiver failure |
| 10 | Line interface failure |
| 11 | Receiver framing failure |
| 12 | Transmit/receive (inter)national bit failure |
| 13 | Yellow (remote) alarm failure |
| 14 | PCM path integrity failure |
| 15 | Loop remote loopback failure |
| 16 | Channel remote loopback failure |

## 2.0 Mb PRI self test

This self test can be run manually on a per-loop or per-channel basis using overlay 60. The DCHI/DDCH and 2.0 Mb PRI must be disabled before performing the self-test.

### Self-test (entire loop)

**1** Disable the DCHI/DDCH using:

**LD 96**

**DIS DCH N**

**2** Disable the 2.0 Mb PRI card and run the self-test using:

**LD 60**

**DISL L**

**SLFT L** (entire loop)

### Self-test (specific channel)

**DSCH L CH** (disable an idle channel)

**SLFT L CH** (specific channel)

## 2.0 Mb PRI automatic loop test

This procedure is not recommended since it causes yellow at the far-end and there is a possibility of some of the B-channels not being re-enabled once the test is completed. Therefore leave the ATLP command set to 0.

The automatic loop test checks the same functions as the self test. Unlike the self test, it can be run automatically as part of the midnight routines.

Procedure (2.0 Mb PRI automatic loop test):

**1** With ATLP command set to one.

**2** If all 30 channels are idle at midnight, the Meridian 1 software disables the card and performs a self test on all channels. This causes a yellow alarm to be generated to the far end.

**3** If any of the 30 channels are busy at midnight, the software disables one idle channel, chosen at random, and checks it while the card is enabled.

With the ATLP command set to zero, only one channel is tested. The channel tested is randomly selected by software; it cannot be specified.

To perform the automatic loop test as part of midnight routines, use

**LD 60**

**ATLP 1 or 0**

## Link diagnostic and remote loop back tests

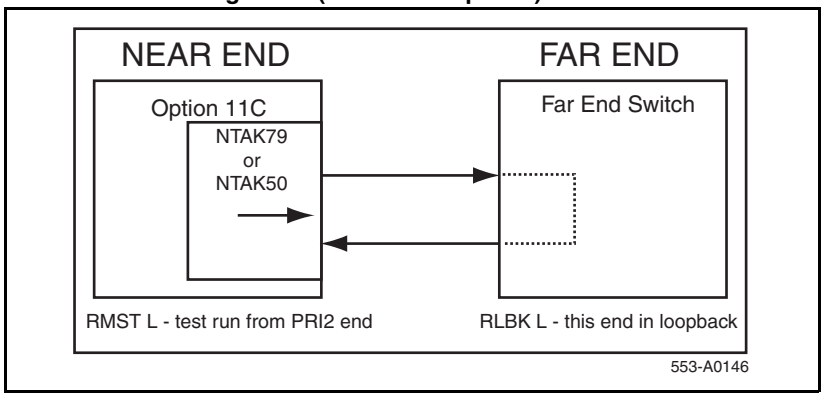
The remote loop-back and the link diagnostic test are performed manually on a per channel or per-loop (or card) basis.

### Link diagnostic test

The link diagnostic test, also called the far end loop-back test, does not test the Meridian 1 2.0 Mb PRI. It puts the 2.0 Mb PRI in loop-back mode so a remote loop-back test can be performed on equipment at the far end. Refer to Figure 12.

The 2.0 Mb PRI channel or loop (card) tested must be disabled.

**Figure 12**
**2.0 Mb PRI Link Diagnostic (Far End Loopback) Test**



### Running the link diagnostic test

To run the link diagnostic test on the Meridian 1, use the following procedure:

**1** Call a technician at the far end. Ask for loopback mode at that facility.

**2** When loop-back mode at the far end is confirmed:

- Disable the DCHI/DDCH using:

  **LD 96**

  **DIS DCH N**

- Disable the 2.0 Mb PRI card and run loop-back test using:

  **LD 60**

  **DISL L**

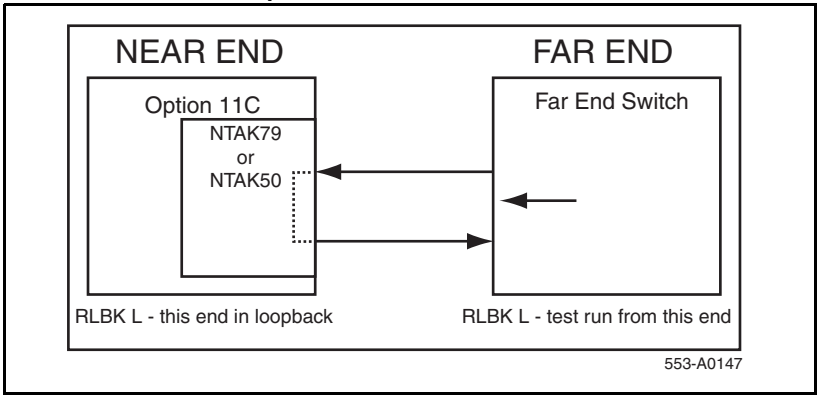
  **RMST L** or **RMST L C**

### Remote loop-back test

The remote loop-back test also called the near end loop-back test, checks the integrity of the 2.0 Mb PRI from the Meridian 1 system to the far end. The far end must be in loop-back mode before this test can be performed. Refer to Figure 13 on page 110.

The 2.0 Mb PRI channel or loop (card) tested must be disabled.

**Figure 13**
**2.0 Mb PRI Remote Loopback Test**




### Coordinating the remote loopback tests

When a technician at the far end asks for loop-back mode on the Meridian 1, disable the DCHI/DDCH using:

**LD 96**
**DIS DCH N**

Disable the 2.0 Mb PRI card and activate loopback mode using:

**LD 60**
**DISL L**
**RLBK L** or **RLBK L C**

# ISL Implementation and Maintenance

## Contents

This section contains information on the following topics:

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## Reference list

The following are the references in this section:

- *Administration* (553-3001-311)
- *System Messages* (553-3001-411)

# Overview

This chapter provides the information needed to implement ISL on the Meridian 1 Option 11C system including:

- hardware and software installation
- programming of components needed to provide basic call service

ISDN features are treated separately in the chapter devoted to ISDN feature implementation.

This chapter builds on the ESN programming that is assumed to be already in place. It is also built on the assumption that you have a basic understanding of NARS and CDP.

Two modes of ISL are available: shared and dedicated. This chapter covers ISL installation in dedicated mode using dedicated and leased lines. Shared mode installations are done according to the instructions supplied for PRI, with the noted exceptions.

# ISL hardware requirements

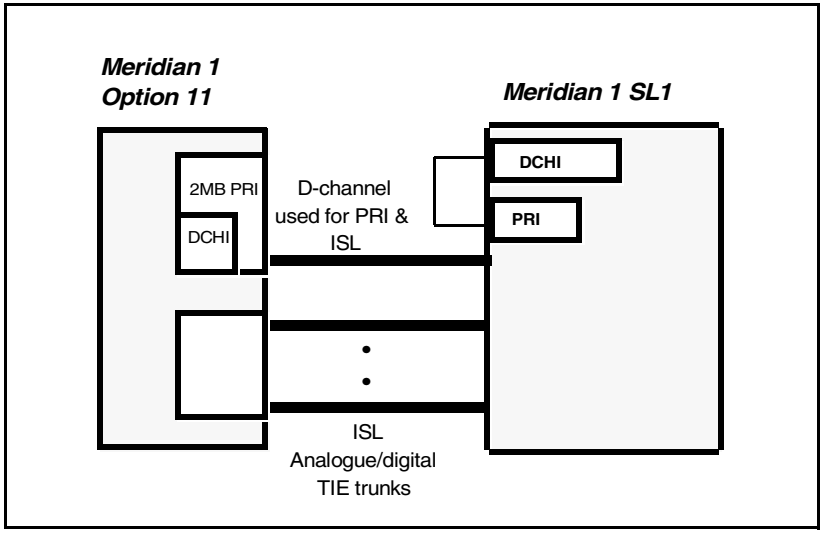
ISL, regardless of the mode of operation, uses analogue or digital TIE lines as B-channels.

## ISL in shared mode

In shared mode, PRI hardware is required in addition to the existing TIE lines interface cards.

- NT8D15 Analogue trunk card(s)
- NTAK02 SDI/DCH, NTAK10 2.0 Mb DTI, NTAK79 2.0 Mb PRI, or NTBK50 2.0 Mb PRI card(s)

**Figure 14**
**ISL in shared Mode**

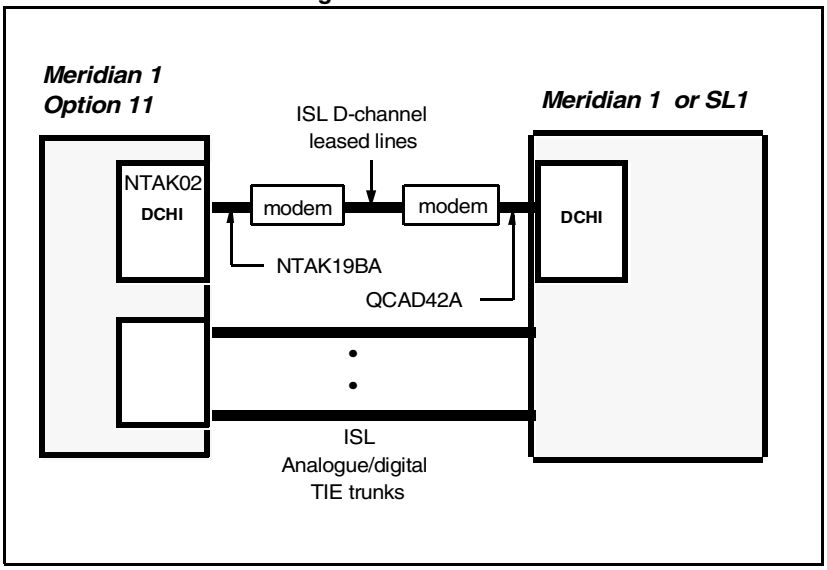



## ISL in dedicated mode using leased line

The following hardware is required:

- NTAK02 SDI/DCH D-channel handler interface
- Modem capable of the following: (such as Ventel 2400-33 or 2400 Plus II)
  - — minimum of 2400 baud
  - — synchronous operation
  - — must support leased line (also known as private line or point-to-point) operation
- NTAK19BA 4-Port SDI Cable

**Figure 15**
**ISL in dedicated mode using leased line**

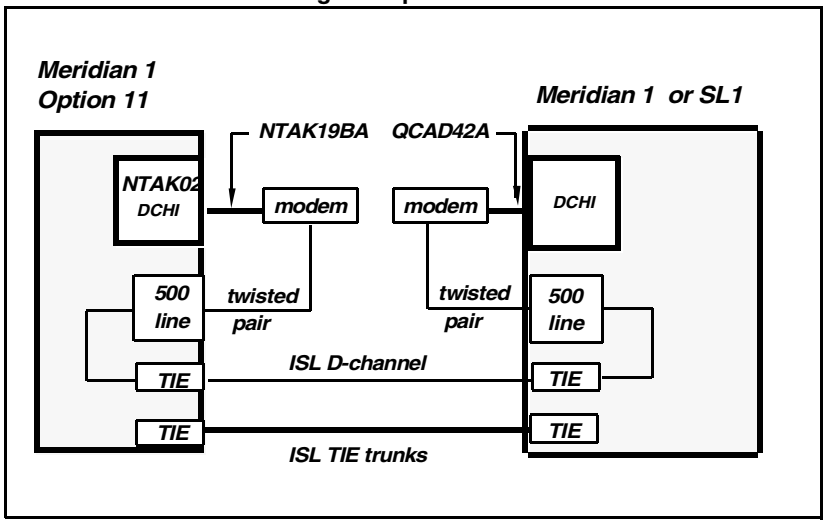



## ISL in dedicated mode using dial-up modem

The requirements are as follows:

- NTAK02 SDI/DCH D-channel handler interface
- Modems such as Ventel 2400, Hayes 2400 (the Hayes Smartmodem 2400 cannot be used on leased lines) or Gandalf 2400 that can support 2 or 4-wire leased line operation (4-wire operation must be specified when ordering otherwise modems are factory shipped for 2-wire operation).:
  - — autodial capability
  - — minimum of 2400 baud
  - — synchronous operation
  - — programmable so that one modem originates the call while the other auto-answers
- NTAK19BA 4-port SDI cable
- NT8D09 500 set line card

**Figure 16**
**ISL in dedicated mode using dial-up modem**




# ISL hardware installation

## Shared mode

The hardware installation is identical to the PRI installation, with the addition of analogue or digital TIE trunks (or both).

## Dedicated mode

**Step 1**
**Install the NTAK02.**

The NTAK02 connects to the modem through the NTAK19BA 4-port cable. Only ports 1 and 3 are available for use as DCHIs.

**a** Set option switches/jumpers on the DCHI card as shown below. for mode of operation (i.e. RS232 or RS422 and DTE or DCE)

**b** Install the NTAK02 in any spare slot 1-9 of the main cabinet

**c** Install the NTAK19BA four port cable on the 50 pin Amphenol connector associated with the slot holding the NTAK02.

**Table 34**
**NTAK02 switch settings**

| Port 0 | Port 1 | SW1-1 | SW1-2 |
|---|---|---|---|
| SDI | DCH | OFF | OFF |
| SDI | DPNSS1 | OFF | ON |
| — | ESDI | ON | ON |

| Port 2 | Port 3 | SW1-3 | SW1-4 |
|---|---|---|---|
| SDI | DCH | OFF | OFF |
| SDI | DPNSS1 | OFF | ON |
| — | ESDI | ON | ON |

**Table 35**
**NTAK02 Jumper settings**

| Unit | Jumper location | Strap for DTE | Strap for DCE | Jumper location | RS422 | RS232 |
|---|---|---|---|---|---|---|
| Unit 0 | J10 | C - B | B - A | | | |
| Unit 1 | J7<br>J6 | C - B<br>C - B | B - A<br>B - A | J9<br>J8 | C - B<br>C - B | B - A<br>B - A |
| Unit 2 | J5 | C - B | B - A | | | |
| Unit 3 | J4<br>J3 | C - B<br>C - B | B - A<br>B - A | J2<br>J1 | C - B<br>C - B | B - A<br>B - A |

**Step 2**
**Set up the D-channel**

**a** If this is a dedicated mode installation using leased line modems, the D-channel connects the DCHI with the far-end modem over a dedicated leased line. Synchronous modems with a minimum 2400 baud data rate must be configured. Modems must support leased line capability and synchronous mode. The Hayes Smartmodem 2400 cannot be used on leased lines

**b** If this a dedicated mode using dial-up modems (modems such as Hayes 2400, Ventel 2400 or Gandalf 2400 can be used): in this configuration, the DCHI is connected to a modem which is connected to a 500 set line card. The call is connected to the far-end through the 500 set-to-TIE trunk path.

To set-up the D-channel, program the modem at one end in the auto-dial mode, so it automatically initiates a call to the other end at power up. The auto-dial number must be coordinated with the far end switch. The originate modem has this auto-dial number stored internally as part of the modem configuration routine.

The far-end modem need only be set-up for auto-answer.

# ISL software programming

There are two modes of ISDN Signaling Link (ISL) operation, shared mode and dedicated mode.

## Shared mode

The NTAK79 on-board DCHI supports ISDN PRI signaling and ISL trunks. The configuration is basically the same as the PRI D-channel, with the D-channel also supporting ISL trunks.

The DTI/PRI software programming sequence can be used (refer to the appropriate chapters for more information) with the following exceptions:

**LD 17 – Shared mode**.

| Prompt | Response | Description |
|---|---|---|
| USR | SHA | D-channel for ISL in “shared” mode, used for both ISDN PRI and ISL. |
| ISLM | 1-240 | number of ISL B-channel (trunks) controlled by the D-channel (no default value). |

**LD 16 – Interface type**.

| Prompt | Response | Description |
|---|---|---|
| IFC | SL1 | interface type must be SL1 (this is the only type supported for ISL). |
| MODE | ISLD | TIE route used for ISL members. |

**LD 14 – Channel identifier.**

| Prompt | Response | Description |
|---|---|---|
| CHID | 1-240 | channel identifier for ISL channels. Must be coordinated with the far-end. |

## Dedicated mode

The DCHI uses the NTAK02 circuit card, and does not support ISDN PRI signaling. The DCHI is reserved for ISL use only. The D-channel can communicate with the far end by means of a dedicated leased line modem, or dial-up modem.

Note that the following programming relates to analogue TIE trunks being used as B-channels. In the case where DTI/PRI trunks are also used then LD 17 digital loop (2.0 Mb PRI) and LD73 (2.0 Mb PRI/SYTI) must also be configured with the appropriate clocking and threshold settings.

For ISL dedicated mode using a dial-up modem, a 500 set, TIE trunk route and member must be programmed (used for D-channel). Table  summarizes the required steps.

**Table 36**
**Configuring Basic ISL Capability**

| Step | Overlay | Action |
|---|---|---|
| 1 | LD 17 | Configure the D-channel for ISL use. |
| 2 | LD 15 | Enable ISDN option |
| 3 | LD 16 | Enable the ISL option on a per route basis, assign a D-channel for each route |
| 4 | LD 14 | Assign a channel identification to each trunk with the ISL option. |

**LD 17 – Configure the D-channel for ISL.**

| Prompt | Response | Description |
|---|---|---|
| REQ | CHG | Change data |
| TYPE | CFN | Configuration data block |
| ADAN | NEW DCH 0-79 | Add primary D-channel |
| CTYP | DCHI | D-channel card type |
| CDNO | 1-9, 11-19, 21-29, 31-39, 41-49 | Card slot in which the card supporting the DCHI resides |
| PORT | 1 | Must be set to 1 |
| USR | PRI | D-channel for ISDN PRI only |
| IFC | SL1 | Interface type |
| DCHL | 1-9 | PRI2 card number. (Must match entry for CDNO.) |

| Prompt | Response | Description |
|---|---|---|
| SIDE | NET (USR) | Net: network, the controlling switch<br>User: slave to controller |
| RLS | XX | Software release of far-end. This is the current software release of the far end. If the far end has an incompatible release of software, it prevents the sending of application messages, i.e. for Network Ring Again. |
| CLOK | | D-channel clock type for signaling |
| | EXT | Source of D-channel clock is external to DCHI card (in this case the DTI/PRI circuit card). Normally, EXT is used for PRI/ISL. Note: do not confuse this clock with the E1 span Clock Controller found on the NTAK10/79. This clock is in reference to the DCHI synchronous mode of operation. (Note: If directly connecting two DCHI ports with out the use of modems, set “CLOK” to “EXT” on one side and “INT” on the other). |
| LAPD | YES,(NO) | Change LAPD parameters. Simply carriage return if timers are to be left at default value. The following timers are prompted only if LAPD is set to YES. The following can all be left at default during initial set-up. |
| T23 | 1-(20)-31 | Interface guard timer checks how long the interface takes to respond. In units of 0.5 seconds (default 20 = 10 seconds). |
| T200 | 2-(3)-40 | Retransmission timer in units of 0.5 seconds (default 3 = 1.5 seconds). |
| N200 | 1-(3)-8 | Maximum number of retransmissions |
| N201 | 4(260) | Maximum number of octets in information field |
| K | 1-(7)-32 | Maximum number of outstanding unacknowledged frames (NAKS) |

**LD 15 –** Enable the ISDN option.

| Prompt | Response | Description |
|---|---|---|
| REQ: | NEW<br>CHG | Add new data<br>Change existing data |
| TYPE: | NET | Networking data |
| CUST | 0-31 | Customer number |
| ISDN | YES | Customer is equipped with ISDN |
| PNI | 1-32700 | Customer private network identifier. MUST be unique to this customer in the private network. Used as part of the setup message for feature operation such as Network Ring Again and Network ACD... |
| HNPA | NPA | Telephone area code for this Meridian 1. Sent as part of setup message as CLID |
| HNXX | NXX | Telephone local exchange code for this Meridian 1. Sent as part of setup message as calling line identification. |
| HLOC | XXX | Home location code (NARS) |
| LSC | 1-9999 | One to four digit Local Steering Code established in the Coordinated Dialing Plan (CDP). The LSC prompt is required for Calling Line I.D. and Network ACD. |
| AC2 | | Access Code 2. Enter call types (type of number) that use access code 2. Multiple responses are permitted. This prompt only appears on NARS equipped systems. If a call type is not entered here, it is automatically defaulted to access code 1. |
| | NPA | E.164 National |
| | NXX | E.164 Subscriber |
| | INTL | International |
| | SPN | Special Number |
| | LOC | Location Code |

**LD 16** – Enable the ISL option.

| Prompt | Response | Description |
|---|---|---|
| REQ | NEW<br>CHG | Add new data<br>Change existing data |
| TYPE | RDB | Route data block |
| CUST | 0-31 | Customer number |
| ROUT | 0-127 | Route number |
| TKTP | TIE | TIE trunk route |
| DTRK | YES<br>NO | Enter YES if this is a Digital Trunk Interface (DTI or PRI) |
| ISDN | YES | ISDN option |
| MODE | ISLD | Route for ISL application |
| DCHI | XX | DCHI port no. in CFN which will carry the D-channel for this TIE trunk route. |
| PNI | 1-32700 | customer private network identifier-must be the same as the CDB PNI at the far end. |
| IFC | | interface type |
| | SLI | Meridian 1 to Meridian 1 |
| CTYP | aaa<br><CR> | Call Type. Enter the call type to be associated with the outgoing route for direct dialing using the trunk access code (instead of NARS access code) |
| INAC | YES | Insert Access Code. Permits the NARS AC1 or AC2 access code to be re-inserted automatically on an incoming ESN call. |

**LD 14 –** Assign a channel identifier.

| Prompt | Response | Description |
|---|---|---|
| REQ | NEW<br>CHG | Add new data<br>Change existing data |
| TYPE | TIE | TIE trunk type |
| TN | c u | Card and unit to be associated with this trunk |
| RTMB | 0-127 1-510 | Route number and member number |
| CHID | 1-240 | Channel identifier for ISL channels (remove with Xnn)—must be coordinated with far end (no default value) |

# ISL maintenance

## DCHI quick reference

Below is a quick reference list of D-channel commands (LD 96).

| Command | Action |
|---|---|
| DIS DCHI N | Disable DCHI port N |
| ENL DCHI N | Enable DCHI port N |
| EST DCH N | Establish D-channel N |
| PLOG DCHI N | Print D-channel statistics log N |
| RLS DCH N | Release D-channel N |
| SDCH DCH N | Release a D-channel and switch D-channels |
| RST DCH N | Reset D-channel N |
| STAT DCH (N) | Print D-channel status (link status) |
| TEST-100/101 | DCH tests |
| STAT SERV | Print the current service and service acknowledge message for DCHI N |

| | |
|---|---|
| ENL SERV N | Enable service messages for DCHI N |
| DIS SERV N | Disable service messages for DCHI N |

## Maintenance messages

D-channel status and error conditions are reported as DCH messages. These messages can be found in the *System Messages* (553-3001-411)

## Maintenance testing

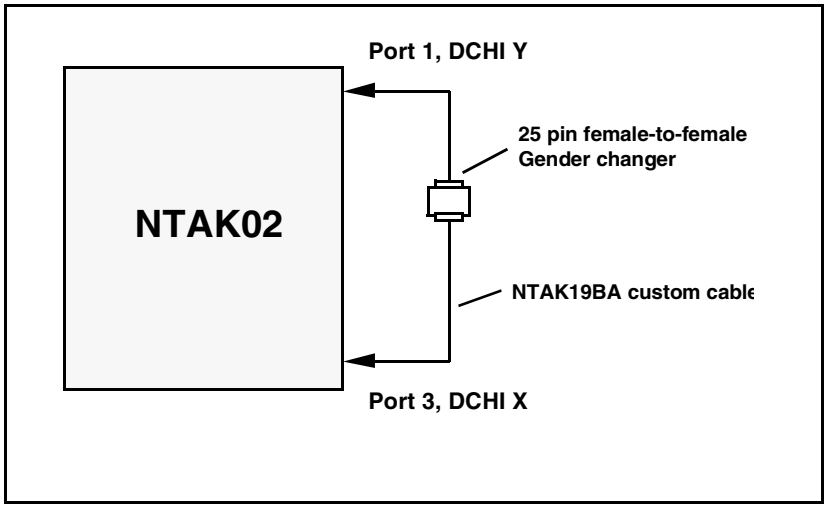
### ISL back to back testing (without modems)

For maintenance reasons or testing purposes it is sometimes necessary to connect ISL back to back (without modems). This connection is normally done within the same Meridian 1 system in a lab environment.

**Hardware requirements:**
A 25-pin female-to-female gender changer is required to connect the NTAK19BA cable back-to-back. The gender changer is not supplied with the Option 11C system. Figure 17 illustrates the connection.

***Note:*** Protocol converters AO378652 and AO381016 supplied with the system are not gender changers.

**Figure 17**
**ISL back-to-back connection**



Port settings:

- For port 3, DCHI X, program the following settings in LD 17:
  - CLOK = INT (Internal clock)
  - SIDE = SLAV (Slave)

  Set NTAK02 port 3 jumper plugs to DCE and RS-422.
- For port 1, DCHI Y, program the following settings in LD 17:
  - CLOK = EXT (External clock)
  - SIDE = MAS (Master)

  Set NTAK02 port 1 jumper plugs to DTE and RS-422.

Meridian 1

# Option 11C

2.0 Mb DTI/PRI

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